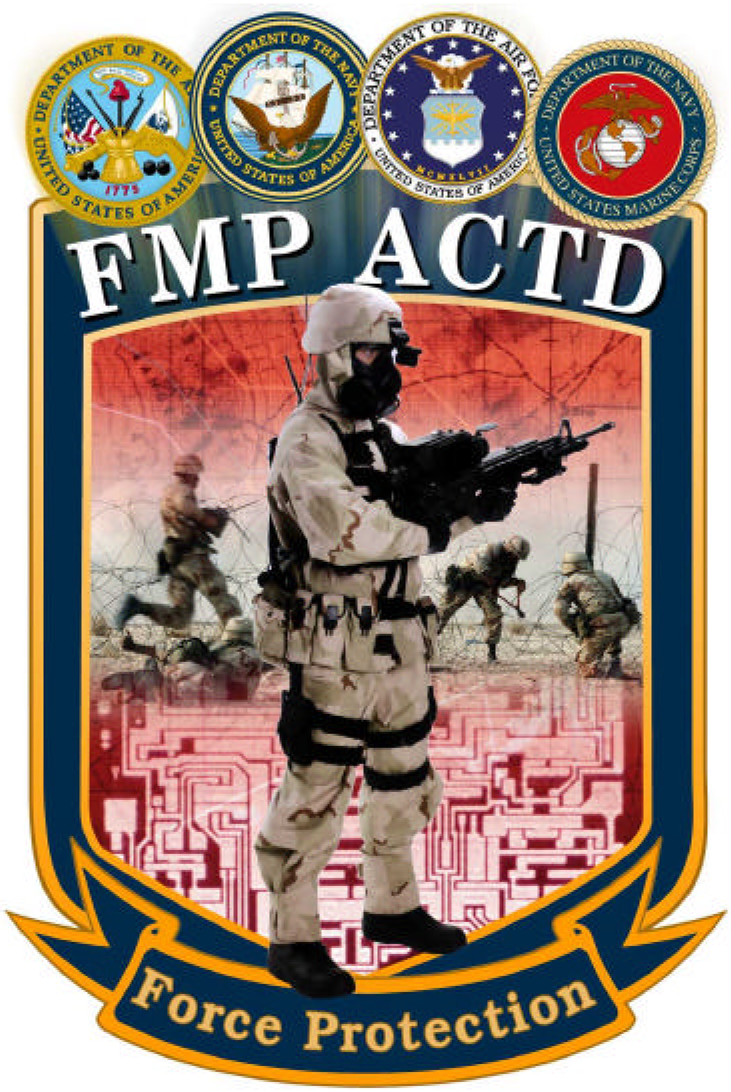
REPORT



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Final Report

For

Contract No. SP0700-00-D3180/DO 0030/TAT 045

On

Individual Passive Chemical Sampler Testing
Continued Chemical Agent and TIC Performance Validation

To

US Marine Corps System Command (MARCORSYSCOM)

April, 2002

By

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ABBREVIATIONS/ACRONYMS

ACGIH	*American Conference of Governmental Industrial Hygienists*
AEGLs	*Acute Exposure Guideline Levels*
ACTD	*Advanced Concept Technology Demonstration*
ATD-400	*Automated Thermal Desorber Model 400 -- a thermal desorption device that was previously manufactured by Perkin-Elmer Corporation*
ATSDR	*Agency for Toxic Substances and Disease Registry*
BTEX	*Common abbreviation for Benzene, Toluene, Ethyl benzene and Xylene*
CoC	*Chain of Custody*
COTS	*Commercial off-the-shelf*
CWA	*Chemical warfare agent*
DOD	*Department of Defense*
DODD	*Department of Defense Directive*
DODI	*Department of Defense Instruction*
DOE	*Department of Energy*
ECBC	*Edgewood Chemical Biological Command*
EEGLs	*Emergency Exposure Guideline Levels*
EPA	*United States Environmental Protection Agency*
ERPGs	*Emergency Response Planning Guidelines*
FMP	*Force Medical Protection*
FPD	*Flame photometric detector*
GAO	*General Accounting Office*
GC	*Gas chromatograph*
GD	*Chemical agent soman*
HD	*Chemical agent mustard*
HMRC	*Battelle Hazardous Materials Research Center*
IDLH	*Immediately dangerous to life and health*
IDL	*Instrument Detection Limits*
IPCS	*Individual Passive Chemical Sampler*
IPT	*Integrated Product Team*
ITF	*International Task Force*
JCAD	*Joint Chemical Agent Detector*
LFPM	*Linear Feet per Minute*
LRB	*Laboratory Record Book*
MAGs-S	*Military Air Guidelines – Short Term*
MDL	*Method detection limit of the analytical instrument as configured and used*
MSD	*Mass selective detector (a mass spectrometer manufactured by Agilent as a detector specifically for GC)*
MARCORSYSCOM	*Marine Corps Systems Command*
MES	*Methyl Salicylate*
MRLs	*Minimum Risk Levels*
NAC	*National Advisory Council*
NAS	*National Academy of Sciences*

NEPMU	*Navy Environmental and Preventative Medicine Unit*
NIOSH	*National Institute of Occupational Safety and Health*
NRC	*National Research Council*
OSHA	*Occupational Safety and Health Administration*
OSHA-SLTC	*OSHA Salt Lake City, Utah Technical Center*
P-E	*Perkin-Elmer Corporation*
PI	*Principal Investigator*
PTFE	*Polytetrafluoroethylene*
QC	*Quality Control*
RH	*Relative humidity, percent (%)*
SKC	*SKC Corporation vapor sampler*
SOP	*Standard Operating Procedure*
SPEGLs	*Short-term Public Emergency Guideline Levels*
TEELs	*Temporary Emergency Exposure Levels*
TG	*Technical Guide*
TICs	*Toxic Industrial Chemicals*
TICN	*Test Item Control Number*
TLVs	*Threshold Limit Values*
TWA	*Time-weighted average (maximum allowed concentration for unprotected full-shift occupational exposure)*
UF	*Uncertainty Factor*
USACEHR	*US Army Center for Environmental Health Research*
USACHPPM	*US Army Center for Health Protection and Preventive Medicine*

Executive Summary

Battelle Memorial Institute's Hazardous Materials Research Center has conducted extensive testing of COTS candidates for the IPCS, conducting laboratory testing with CA and supporting field tests with simulant on the candidate samplers. In a prior study the HMRC evaluated the feasibility of collecting and analyzing chemical agents on three candidate COTS IPCS using an ATD-400 and a GC-FPD. Based on that testing the P-E sampler was dropped because sufficient agent could not be collected at either the TWA or the IDLH for agents GD and HD.

The field of candidates was reduced to two items, the GoreSorber® and the SKC sampler. Based on the first phase testing and first field test, both samplers required some modification which the suppliers did to their respective products. The GoreSorber® was modified prior to this phase of testing to remove the buttonhole on the sampler, reduce the flow rate (mL/min) of the sampler, and to make the flow more directional into the front of the badge. The SKC sampler was modified so that the sorbent could be removed from the badge directly into the P-E tube used to desorb chemicals from the sorbent into the sampler.

A GC-MSD was then integrated onto the ATD-400. This allowed a direct thermal desorption from the ATD into the GC-MSD. An internal standard kit was ordered and added to the ATD during the initial phases of the program.

The HMRC then conducted much more testing on the selected sorbers, including system MDL, sorber capacity, comparison of other sorbents than Tenax TA, evaluation of an extruded rather than loose pack material for the GoreSorber®, GoreSorber® uptake rate as a function of face velocity, temperature and RH effects during adsorption, and sampler shelf life determination.

The HMRC has concluded that both the GoreSorber® and the SKC sampler can collect quantitative levels of agent and be successfully analyzed for that agent. The SKC sampler has the advantage of more sorbent being present in the sampler that may allow longer sampling periods. The higher sampling rate of the GoreSorber® makes it advantageous for low levels of chemical agent that may not be collected at a quantifiable level by the SKC sampler.

Neither sampler appears to be able to be exposed and stored at room temperature for a sufficient time to allow this technology to be used for large groups of warfighters in its current embodiment. The time for analysis is likely to push analysis beyond the after-exposure storage time that is allowed for accurate estimation of exposure. Further, the Tenax TA appears to collect substantial amounts of background chemicals that interfere with the storage, collection, and desorption of chemicals. For this reason it also recommended that shelf life for unused sorbers be minimized.

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1.0 INTRODUCTION

The destruction of Iraqi chemical warfare munitions by U.S. demolition units resulted in the release of sarin/cyclosarin nerve agents. The Central Intelligence Agency (CIA) and DOD estimated in September 1997 that the demolition of Iraqi chemical-filled munitions released plumes of nerve agent gas that extended over U.S. troops located hundreds of kilometers away.

The Department of Defense, reported that nearly 700,000 troops who served during Operation Desert Storm and Operation Desert Shield in 1990 and 1991 were potentially exposed to low-level chemicals, some troops have reported symptoms ranging from chronic fatigue, muscle and joint pain, memory loss, balance disturbances, sleep disorders, depression, chronic diarrhea and concentration problems. There is not enough exposure evidence to link the long-term health problems suffered by some Gulf War veterans to certain drugs or chemicals that they may have been exposed to during the war.

Even though uncertainties regarding wind, agent purity, released quantities, and unit locations prohibit definitive calculations of the dose and length of exposures, if any, to individual soldiers, the agencies estimated that 98,910 U.S. troops were potentially exposed to at least the general population limit dose. In addition, to this incident, DOD identified 12 other instances of suspected chemical warfare agent exposures during Operation Desert Storm.

1.1 Need

The objective of DOD’s nuclear, biological, and chemical (NBC) defense program is to enable U.S. forces to survive, fight, and win in NBC warfare environments. DODD 6490.2, section 4.5 states: “Medical surveillance shall encompass the periods before, during, and after deployment: To monitor environmental, occupational and epidemiological threats and diverse stressors; to assess disease and non-battle injuries, stress-induced casualties, and combat casualties, including those produced by chemical and biological and nuclear weapons.” Furthermore DODI 6490.3, section 6.1 states, “In the future, several new systems and procedures wil be required to initiate a comprehensive medical surveillance program for monitoring… … the identification and

assessment of potential hazards and actual exposures to environmental contaminants and stressors." This is also echoed in September 1998 GAO Report which concluded that the Secretary of Defense develop a strategy for comprehensively addressing force protection issues resulting from low-level chemical warfare agent exposures addressing, "the need for enhanced low-level chemical warfare agent detection, identification, and protection capabilities."

National Academy of Sciences (*Strategies to Protect the Health of Deployed U.S. Forces*) recommends that, "The Department of Defense should proceed with a robust program to develop chemical detectors and biological detectors that can detect and measure low-level as well as high-level concentrations. The first priority should be the development of improved passive sampling devices based on existing technologies that could be fielded quickly. The Department of Defense should establish the long term goal to develop very small devices that could be deployed with each individual to measure and record automatically exposures to one or more of the most threatening agents, the location of the individual, the activity level of the individual, the microenvironment, and the time." Presidential Review Directive –5, objective R 4.1.5 echoes the above DOD needs, "Conduct research to develop smaller, lighter, simpler, more sensitive, and more rugged personal and area environmental samplers and detectors that are capable of measuring and/or sampling multiple exposures/chemicals at toxicologically relevant levels."

To address the President's, NAS's, GAO's, and DOD's requirements, a two-phase acquisition ACTD strategy approach was designed with flexibility toward technological upgrade insertions before, during, and after ACTD fielding.

Phase I. Phase I focuses on passive sampling which addresses the National Academy of Sciences (NAS) number one priority. This will be accomplished with commercial-off-the-shelf (COTS) samplers and analyzers.

Phase II. Phase II technology provides more focus on the additional priorities and objectives of measuring and recording exposures to "threat agents" in "near-real-time." The data collected from the device during Phase II will be used to feed into other systems, such as Theater Medical

Information Program (TMIP) and Joint Warning and Reporting Network (JWARN), and/or signal the presence of environmental contaminants to an individual.

The minimum acceptable performance will be detection at the individual level, measurement below symptomatic thresholds, and automated archival into existing DOD medical database systems. Therefore, the sorbent technology combined with the near-real-time technology will provide significant increase in force medical protection.

The Chemical Biological Individual Sampler (CBIS)[1] Program mission is to provide force protection by evaluating the presence and/or absence of low-level CB agents or Toxic Industrial Chemicals (TICs). The CBIS System will provide a capability to measure low-level exposures to CB agents or TICs. The CBIS System, along with intelligence, CB agent pre-treatments, treatments, and protective clothing and equipment, will integrate with and enhance the current CB defense and force protection systems.

The environment of the warfighter contains many chemicals. In addition to normal environmental contaminants like dust there are fuel vapors and combustion products, gases from fired weapons, tobacco and its combustion products, foot powder, breath mints, and miscellaneous materials like military smoke obscurants. In addition to military contaminants, there are other environmental contaminants like pesticides, polychlorinated biphenyls and many toxic industrial chemicals that may also be present depending on where the mission is taking place. A system must be able to determine the presence or absence of chemical agent and TICS in areas containing these types of contaminants.

CBIS is comprised of an individual CB Sampler and a Sample Reader. CBIS will be capable of collecting CB agents and TICs. The Sampler Reader will analyze the CBIS and identify CB/TICs at sensitivity levels that are consistent with low-level health risk. CBIS will be worn on the individual warfighter's Load Bearing Equipment (LBE), be capable of collecting the targeted CB agents and TICs at concentrations less than or equal to pre-clinical doses. CBIS will

[1] The passive CBIS for collecting CA and TICs is also called the Individual Personal Collection System (IPCS). This term has evolved to show one form of the overall CBIS

generate data compatible with current and future Joint NBC defense equipment and military medical databases systems.

CBIS will enhance force protection by providing individual samplers for monitoring CB agent and TICs vapor concentrations and accumulated dose. It will be deployable under all battlefield conditions and counter-terrorism operations. CBIS is expected to enhance force protection by assisting the commander in assessing the CB warfare agent risk, and implementing pre-treatment regimens.

Currently a true integrated Nuclear - Biological - Chemical (NBC) defense and force health protection system that is designed to sample low levels of chemical agent (CA) exposure does not exist. These low levels are below those that would cause immediate symptoms, and are below the levels of detection of the CA detectors currently used in the field. In addition these CA detectors generally do not respond to toxic industrial chemicals (TIC), which also are a threat to the health of the warfighter. The force medical protection community lacks the means to measure and record the individual warfighter's exposure to low levels of chemical and biological (CB) agent or TICs. This information is crucial to assess the risk to individuals to continued low-level exposure and to diagnose near and long term health monitoring and treatment programs.

The Force Medical Protection ACTD addresses this need by evaluating the presence and/or absence of CB agents or selected TICs using a chemical-biological individual sampler. The CBIS system will provide non-intrusive capability to measure sub-clinical exposures to these toxic materials and provide exposure data for health surveillance.

1.2 ACTD Background

The Advanced Concept Technology Demonstration (ACTD) program was implemented to help the DoD acquisition process adapt to today's economic and threat environments. ACTDs emphasize technology assessment and integration rather than technology development. The goal is to provide a prototype capability to the warfighter and to support him/her in the evaluation of

that capability. The warfighters evaluate the capabilities in real military exercises and at a scale sufficient to fully assess military utility.

ACTDs are designed to allow users to gain an understanding of proposed new capabilities for which there is no user experience base. Specifically, they provide the warfighter an opportunity: to develop and refine his concept of operations to fully exploit the capability under evaluation, to evolve his operational requirements as he gains experience and understanding of the capability, and to operate militarily useful quantities of prototype systems in realistic military demonstrations, and on that basis, make an assessment of the military utility of the proposed capability.

At the conclusion of the ACTD operational demonstration, there are three potential outcomes. The user sponsor may recommend acquisition of the technology and fielding of the residual capability that remains at the completion of the demonstration phase of the ACTD to provide an interim and limited operational capability. If the capability or system does not demonstrate military utility, the project is terminated or returned to the technology base. A third possibility is that the user's need is fully satisfied by fielding the residual capability that remains at the conclusion of the ACTD, and there is no need to acquire additional units.

1.3 COTS Background

The measurement of industrial hygiene exposure is a relatively mature industrial practice. For compounds such as carbon monoxide and particulate there are real-time analyzers that will measure the exposure of a worker. For most other compounds the preferred sampling and analysis technique is to collect the compound on a sampler (filter, adsorbent tube, or similar media). Most procedures use a pump that pulls a gas sample through the sampler.

Sampling is followed by analysis by either gravimetric or a variety of instruments including gas chromatographs. Where the sample is measured by GC or other instrumental analysis, the sample is extracted from the sampler by solvent extraction.

A fairly recent system for measurement of chemicals is the passive badge. This badge relies on diffusion across a fixed thickness to control the sampling rate of the gas. This approach gives flow rates in the 10-50 mL/minute range (compared to 50-500 for most pumped systems). Currently, the samples from badges are extracted by solvent and analyzed by GC or other instruments that are appropriate to the type of material being analyzed.

One major problem for low-level quantification is dilution. To extract the sample, 1-5 mL of solvent is used with the sorbent. This quantity can be concentrated to about 0.5 mL. Only 1-2 µL of the material is injected into the GC. This means that if 1 ng is collected on the sampler, only 0.002 ng are available per analysis of a sample using normal extraction procedures.

To reduce or eliminate dilution due to extraction, thermal desorption of the adsorbed material is being done. This technique allows the full quantity of material adsorbed to be injected into the instrument for analysis. This improves sensitivity by up to 1000 times that of solvent extraction followed by analysis. Unfortunately, thermal adsorption is not very effective for charcoal, so different adsorbents must be used. One such adsorbent that has been used for chemical agents and other organic chemicals is Tenax.

In order to select an off-the-shelf system for evaluation, the range of samplers, adsorbents, thermal desorbers, and analyzers needed to be screened. The evaluation then uses the preferred system to sample and determine the chemical agent and TICs present in the warfighter's environment.

2.0 OBJECTIVES

The objectives of this program reported here are only those of the Battelle effort, which was a major subset of the total FMP ACTD objectives necessary to validate the use of passive samplers as chemical agent collectors. The objectives of the overall Battelle effort were:

1. Identify potential system candidates for sampling and analysis for chemical agent,
2. Screen potential sampling technologies to determine the ability of the sampler to collect agent,

3. Collect data on the validity of the sampling and analysis system selected under laboratory conditions.
4. Integrate a GC-MSD and ATD-400 for IPCS sample analysis.
5. Collect data to compare extruded GoreSorbers® and powder containing GoreSorbers®.
6. Compare Carbopak X to Tenax TA as a possible alternate sorbent.
7. Evaluate the face velocity effect on GoreSorbers®.
8. Evaluate badge capacity when loaded with various chemicals.
9. Conduct interference tests to determine the effect on agent collection for potential interferences.
10. Evaluate sampler hold time over various time periods.
11. Conduct miscellaneous studies as necessary to support design of collection system.
12. Support field tests at three field tests.
13. Coordinate with OSHA, USCHPPM, and other laboratories as required to prevent duplication of efforts, collect available information, and to maximize data comparability.

Objectives 1 – 3 were from a previously conducted program task and were reported separately. Objective 12 is reported separately in the appendices but is commented upon in this report.

3.0 TECHNICAL APPROACH

The strategy for Phase I testing was planned and carried out as follows:

1. A market survey was conducted to determine candidate off-the-shelf equipment to comprise the system.
2. Field testing was supported by analysis of samplers both opened in the field and also pre-spiked with simulant to determine the potential effect of field contamination and survival of agent when initially exposed. Timing of the analysis process was conducted to determine realistic post-exposure analysis rates. Reports on field testing are contained in Appendices D, E, and F.

3. Laboratory testing was conducted to determine the ability of three candidate Commercial-Off-The-Shelf (COTS) samplers of different designs to collect detectable amounts of chemical agent at the TWA and the IDLH. This testing was performed at the Battelle HMRC in early 2000.
4. Testing was continued with more extensive laboratory studies at varied temperature and humidity to represent different climatic conditions, with selected toxic industrial chemicals (TICs) to represent potential additional chemicals of interest; conduct an evaluation of face velocity effect on one sampler; evaluate the potential for use of different sorbents; evaluate the capacity of the passive badges; and conduct evaluation of selected chemicals as interferences to chemical agent adsorption. The plan is contained in Appendix A.

This report is a comprehensive report on these four activities. The principal foci will be on the activities of task number 4 above in order to fully document this last task and in integrating all of the data collected in this program into a comprehensive analysis.

3.1 Market Survey

The market survey considered the state-of-the-art in personnel monitoring in industrial hygiene practice and low-level environmental measurement. The market survey covered a wide range of candidates, but selected passive sampling as the best logistical method for sample collection.

The IPCS prototypes that were investigated are passive samplers that are currently used by industrial operations to monitor worker chemical exposures in an industrial setting over a 2-hour to 8-hour period. The samplers are generally constructed as small, wearable badges that contain Tenax® or another adsorbent material. Tenax® is a commonly used wide-spectrum adsorbent for air-borne organic materials that has a demonstrated capability to capture CA vapors.

Three different sampler types were selected for testing. The three samplers were:

- GoreSorber ® manufactured by W.L Gore and Associates Inc (containing Tenax TA)
- SKC 575 series passive sampler containing Tenax TA manufactured by SKC Inc. (SKC).

- Perkin-Elmer (PE) sampler manufactured by Perkin-Elmer containing Tenax TA

These three samplers were chosen based upon the Market Survey titled: *Chemical and Biological Individual Sampler (CBIS) Literature Search and Market Survey*, dated June 4, 1999. This Market Survey recommended four representative sorbent samplers for the CBIS program. These were the three above and a sampler manufactured by Ogawa and Company Inc. The Ogawa and Company samplers were colorimetric only and not suited for analysis by thermal desorption so it was not tested. The three samplers that were tested are presented in Figure 3.1.

Figure 3.1 Samplers

For this test Gore, SKC and Perkin-Elmer samplers were asked to make recommendations on sorbent for this use. The sorbers were then filled by the company with the material that their respective companies believe best for the application. All three companies indicated that their sorbers contain Tenax TA.

The P-E sorber is designed to fit directly into the ATD-400. The GoreSorber contains two small sorbent packets. For testing, the GoreSorber was opened and a packet was placed into a P-E tube for thermal regeneration on the system.

The GoreSorber is a flexible package that is porous and contains two pillows filled with sorbent. After use, the pillows are recovered from the sorber body and placed into an empty P-E tube so that it can be directly desorbed.

The SKC S75 was provided in two configurartions, in Phases I and II, it was tested with a porous metal housing inside that contains Tenax TA. The housing was regenerated using a TD Sorb. The agent off-gas from the TD Sorb was collected in a P-E tube filled with Tenax TA. This PE tube was then analyzed by the TD-400/Shimadzu GC-FPD.

After Phase II, SKC provided and SKC 575 with a special back-plate that was filled with Tenax TA sorbent. After exposure, a plug is removed from the back plate and the Tenax TA is poured into an empty P-E tube. This P-E tube was then analyzed by the ATD-400/GC-MSD.

This system design uses agent extraction from the sampler by thermal desorption, rather than solvent extraction. There are reduced logistical and safety concerns associated with thermal desorption. Compared with solvent extraction, thermal desorption also provides a lower threshold of detection due to less sample dilution. The Government directed thermal desorption because of its likelihood to be the least logistical burden and the least sensitive extraction method.

In the Market Survey, several thermal desorption units were identified. One unit, the ATD-400 manufactured by Perkin-Elmer, was capable of unattended operation and analysis of multiple samples sequentially. A second unit, the TDSorb, performed the same operation, but was limited to only one sample being loaded at a time. It had the advantage of being able to hold larger and more varied shapes of samplers.

In order to successfully desorb the agent from the samplers, the sampler must fit into the desorption device. Only the GoreSorber and Perkin-Elmer samplers could be configured to fit into the ATD-400 unit (the GoreSorber was opened and a Tenax pillow was removed with forceps and inserted into the ATD-400 tube, while the P-E sorber caps were changed and fitted directly onto the desorber) so that unit was chosen to desorb those samplers.

The SKC sampler was desorbed using a TDSorb. Because the TDSorb cannot interface directly to the GC/FPD, a two-step process was used; first, desorb the SKC badge and adsorb the sample onto a standard Tenax-packed sorbent tube to interface with the ATD-400, and second, analyze

the Tenax-packed sorbent tube on the ATD. This method of analyzing the SKC sampler was necessary because the sorber could not be directly desorbed into a GC because of gas flow and temperature considerations. Additionally, because the TDSorb can handle only one badge at a time, and desorption takes 10-30 minutes, desorption could not be done immediately after exposure for all sorbers; there was a finite delay period before desorption by the TDSorb as well as by the ATD-400.

A number of different analyzers were identified by the Market Survey to be capable of detecting vapor samples thermally desorbed from the samplers. For laboratory testing, the analyzer must exhibit high sensitivity and selectivity. Because an MSD did not have sufficient lower threshold sensitivity Battelle elected to use a Shimadzu dual FPD in the laboratory. These units have the necessary sensitivity and selectivity and the Shimadzu was already configured to run automatically with the ATD-400 desorber and with the HMRC's data system.

3.2 Field Test

Three field trials were performed as part of the FMP ACTD operational assessment. These events provided a forum to examine issues integral to the operational effectiveness of the IPCS system. Some of the factors evaluated included durability, mounting, personnel requirements, and impact on personnel.

The first exercise utilized a platoon of Marines during training exercises. Thes training exercises included movement through a wooded terrain, movement with live fire, and base security exercises. Mounting problems resulted in a loss of all but a few samplers from this exercise. A number of chemicals that were related to live fire and CS were found on the badges that were retained.

Fort Benning, GA provided the setting for the setting for the second exercise, a series of attacks on a mount facility by a Marine platoon. In this exercise, mounting problems were fixed and two sampler changes occurred during the 7 day exercise, simulating three year periods. In addition to the passive samplers worn on the Marines, additional samples were mounted on a board in the

center of the mock village. Some of the samplers, both on the Marines and in the village, were pre-exposed to MES, a mustard simulant, to test retention of MES in the sorbent. The results show some interesting trends and variations. The pre-exposure spiked samples show a loss of MES from the samplers on the order of 50 to 75 percent. These losses were, with two exceptions, from samplers dosed in Group A ("old GoreSorbers®). The analysis of the loading of the Group A control samplers immediately after spiking showed an average loading of 621 ng with a deviation of 155 ng. This is very high variability when compared with agent spiking done with a similar chamber earlier this year, using the same methodology. It can reflect either a variable that was not controlled well, or a variability in the analysis of samples immediately after dosing.

A number of samplers are present where the MES loss is between one and two deviations above the average pre-deployment loading. Whether this represents failure to penetrate the pillow "case" inside the sorber followed by reverse diffusion, breakdown of the material on the samplers, or some other effect is not certain. However, the relative standard deviation of post-exposure concentrations for both the GoreSorbers® and the SKC samplers on the control board is less than 8 percent, which may also indicate an analysis problem on the samplers analyzed during pre-exposure as discussed above. However, an analysis variation of this magnitude is not likely considering the efforts made to assure calibration (e.g. standard samples in between measured samples, frequent recalibration, etc.)

MES is also present on samplers that should have been nominally clean. There are several possible explanations. For instance, MES is commonly used in a variety of personal products (Altoid mints, foot powder, Absorbine Jr. and Ben-Gay rub are several primary examples) and the MES present may be from the usage of these products. Another less-likely possibility is that there was cross contamination of the samplers during transportation or deployment due to off-gassing of the samplers in high heat or high humidity situations. This second hypothesis is highly unlikely because each sampler was handled with clean gloves and individually packaged in a glass container with a Teflon®-lined lid before it was placed in a box.

Samplers in all three wear cycles gained between 5 and 20 ng of MES per day of use. In addition, as well will be discussed the control samplers, which were in a static position in the field exercise area, also gained MES, although at a lower rate.

There are a number of samplers that have had substantial amounts of limonene and undecane deposited on them. While 5,000 ng appears to be a large quantity, assuming a 40 mL/minute diffusive air flow into the badge and a four-day exposure time, this represents only 0.022 mg/m^3 average concentration exposure, which is well below the safe "no-adverse-effect" levels for these compounds. Even assuming all of this material being deposited in a 15-minute block of time would represent an average exposure concentration of only 8 mg/m^3. Both of these levels are well below expected toxic levels for these materials.

Based on these trials, MES concentrations on the badge appear to vary from pre-exposure to post-exposure by over 50%. However, the MES variation after exposure between control-board badges that were pre-exposed appears to vary only 5-8 percent. This occurrence should be investigated more fully or another simulant, including deuterated MES, should be evaluated so that pre-exposure can be definitively separated from post-exposure.

The third exercise was aboard the USS Iwo Jima during the shakedown cruise. No samplers were mounted on personnel for this test, but instead were mounted on boards in the five separate compartments. Duplicate samplers measuring 3 time periods during the cruise were used with concurrent analysis afterward by three labs (OSHA, Battelle, and USACHPPM). The blank results for the samplers show that the SKC samplers, on a per-sampler basis, had much more contamination on it than the Gore. However, the background on the GoreSorbers® appears much more variable than the background on the SKC's. Further, because the SKC sampler has about 250 mg of sorbent vs 40 mg per Gore pillow, the GoreSorber® has 4.5 ng/mg of sorbent (about half of this is limonene) vs. 2.5 ng/mg of sorbent in the SKC. Gore's clean-up process is proprietary, so Battelle cannot comment on this further. SKC has indicated that their cleanup process is a thermal desorption process, and that the Tenax in these samplers was treated to only 240 C instead of 280 C that is used for desorption in the ATD. Their technical people have indicated that this material can be cleaned up more by thermal desorption.

For virtually all cases for the SKC sampler, the 7-day collection quantity appears to be much more than 21 times the 8-hour collection quantity or 7 times the 24-hour collection quantity. This may indicate either a much larger end-of-cruise loading for all compounds, or it could indicate a non-linear loading rate and a secondary effect such as an initial low and then a later higher variable face velocity across the sampler.

However, for the Gore samplers, the 8 and 24 hour samplers seem to be somewhat in line, but the adsorption of the 7-day sample appears to be much more variable than the other two samplers. Again, this may indicate end-of-cruise loading, but may also indicate other effects.

Except for the Oil Test Lab, all 7-day Gore samplers have a zero result for MIBK and several others show a zero result for compounds such as nonanal and dimethyl naphthalene. The SKC results seem to be more consistent, that if the 8-hour sample and the 24-hour sample show a result, then the 7-day result also shows a result larger than either of the other two. This may indicate that the SKC sampler tends to hold the chemical (prevent reverse diffusion or some other phenomena such as chemical breakdown) better than the Gore sampler. This conclusion also will require experimental verification.

The low-flow SKC samples indicate several points; first, much of the field blank background (about 50% of it) results from field blank exposure and handling. The first set of data (samplers A-H) are blank samplers that were post-spiked with MES in the Battelle chamber. The total "blank" quantity of the identified organics for the SKC samplers is 1.4 ng/mg vs 2.5 ng/mg for the exposed field blanks discussed previously. For the Signal Bridge samples, there appears to be a fairly strong correlation between the quantity captured on the low flow SKC badges and the normal flow SKC badges. This correlation shows the flow in the low flow SKC at about 40% of the regular SKC sampler. This is in line with expected results. No correlation was investigated for the Well Deck.

Badge analysis results indicate that there is methyl salicylate present in the sampled areas. Post-spike results show that there is still capacity to adsorb left, and that the adsorption of MES during

post-exposure is very uniform which appears to indicate that the badges are still performing well after exposure.

3.3 Laboratory Test Approach

The test approach focused on a Phase I test of initial performance testing of the system and likely candidate samplers. This testing was then followed by Phase II, which was more exhaustive testing of the samplers in the laboratory when subjected to different conditions. Field testing support was conducted as Phase III of the program. Phase IV of the program dealt with additional sampling at temperature and humidity conditions and un-refrigerated hold time, testing of capacity for the selected sorbers, interference testing of the sorbers, and determination of the face velocity of the GoreSorber.

3.3.1 Phase I Testing

The first phase tests exposed a sampler in a chamber to concentrations of agents GD and HD at the IDLH and at the TWA. The IDLH tests challenged the samplers for 30 minutes and the TWA tests challenged the samplers for 8 hours. All sampler candidates were tested in the chamber simultaneously to eliminate variability from one challenge exposure period to the next. The data were evaluated for comparison to chamber concentrations, and were used to evaluate whether a sampler system would be carried on to the next evaluation.

Testing in Phase I was divided into multiple trials. This program conducted up to four tests on each passive sampler. Testing began with GD because it was the more volatile of the two agents selected and has the lower detection requirement. Testing was conducted on both agents to determine if a particular sampler system functions significantly different with either agent. The trials were conducted as follows:

1. Test 1 GD IDLH, where seven (7) replicates of all three sampler types (21 items) were tested against the IDLH concentration of GD
2. Test 2 GD TWA, where seven (7) replicates of all three sampler types were tested against the TWA level of GD

3. Test 1 HD IDLH where seven (7) replicates of all three sampler types were tested against the IDLH level of HD, and
4. Test 2 HD TWA where seven (7) replicates of all three-sampler types were tested against the TWA level of HD.

3.3.2 Phase II Testing

The second phase of this program consisted additional tests for both agent types. The purpose of these tests was to determine if sample holding time degrades analysis. For these tests, up to two sampler system candidates were tested at both IDLH and TWA concentrations. These two candidates were selected based upon their comparability to challenge concentrations, and minimum statistical variability.. During these tests, the samplers were challenged in a similar manner in the first phase. The samples were then analyzed after a set holding time, during which they were stored at a temperature of 35-40 ^{o}F in a plastic bag with a sorbent such as charcoal. Specifically, half of each set of sampler types was analyzed 24 hours after challenge and the second half was analyzed after seven days. This test determined the effect on the results of the total time available for each sampler to be collected, transported, and analyzed in the field.

To conduct this testing, only two samplers from Phase I were carried on to Phase II. Samplers selected were those providing the best quantitative agent recovery for each agent at each condition (TWA and IDLH) and providing the most reproducible results (e.g. best statistical evaluation).

5. Test 3 GD IDLH, where fourteen (14) replicates of up to two sampler types (28 items) were tested against the IDLH concentration of GD. Seven (7) samplers were analyzed after 24 hours and seven (7) samplers were held and analyzed after seven days.
6. Test 4 GD TWA, where fourteen (14) replicates of up to two sampler types (28 items) were tested against the TWA concentration of GD. Seven (7) samplers were analyzed after 24 hours and seven (7) samplers were held and analyzed after seven days.

7. Test 3 HD IDLH, where fourteen (14) replicates of up to two sampler types (28 items) were tested against the IDLH concentration of HD. Seven (7) samplers were analyzed after 24 hours and seven (7) samplers were held and analyzed after seven days.
8. Test 4 HD TWA, where fourteen (14) replicates of up to two samplers (28 items) were tested against the TWA concentration of HD. Seven (7) samplers were analyzed after 24 hours and seven (7) samplers were held and analyzed after seven days.

A final report was issued on these tests

Support three field tests conducted to determine field utility and application of the commercial systems. This support was provided for three tests, two on land and one during an initial cruise. A simulant (methyl salicylate) was chosen to simulate agent because of its similarity to agent HD. Some samplers were pre-challenged; others were post-challenged to determine if the capacity of the sorber had been exceeded. Most of the samplers were exposed in the field and analyzed in the laboratory.

3.3.3 Additional Laboratory Tests

10. All testing focused on parameters affecting "sampling system" performance, meaning that the performance from sampling through analysis will be considered. The testing used the Gore and SKC passive air samplers. Although of different design, both samplers used Tenax TA with a 20/35 mesh size as their absorption media. In addition, testing evaluated design and methodology improvements made to the samplers and analytical methods. The overall goal of this testing was to produce parameters that can be transferred directly to field operations.
11. Integration of the thermal desorption unit (ATD-400) with the gas chromatograph/detector (Aglient 6890/5973 GC-MSD with turbo pump). This combination served as part of the "baseline" IPCS system. The testing at OSHA

SLTC will also utilize this combination except that they will substitute the newest model of Perkin-Elmer thermal desorber, the Turbomatrix®, in their tests.

12. Determination of the instrument minimum detection limits (IMDL) of the analysis system for IPCS. A dual approach was used to characterize the IMDL. First the IMDL of the GC-MSD will be determined for each chemical using direct injection into the device and generation of a calibration curve. Next the "system" IMDL will be determined by depositing known quantities of the target chemicals onto ATD tubes packed with GoreSorber pillows and then running through the desorption/analysis process. The IMDL study will look at not only the CWAs and TICs on the Battelle list, but also the TICs listed for OSHA SLTC. This will give the program an idea of those chemicals compatibility with the system and will generate confidence in the similarity of results between laboratories. The remaining tasks will concentrate only on the Battelle target chemicals.
13. A task was conducted to determine the use of a different sorbent than Tenax. Supelco has a new sorbent, Carbopack X®, which is supposed to have a broader chemical affinity. The Carbopack X® was evaluated in one trial using ATD tubes filled with Carbopack X® against tubes filled with Tenax TA®.
14. The Gore commercial off-the-shelf sampler system was tested at three face velocities using agent challenge to assure that agent flux rates into the badge are relatively constant over the three face velocities. The data on the SKC design is available in an OSHA report *Determination of the Sampling Rate Variation for SKC 575 Series Passive Samplers*. This report was used as a reference for SKC face velocity data.
15. Interference of other chemicals with sampler performance will be tested to determine the effect on sampler performance absorbing target compounds. This will be done by exposing the samplers to a realistic amount of background chemical loading that could be expected during a 7-day use cycle. The initial background chemical selection was chemicals that were observed to be present in the background at the field tests. The samplers were also challenged with the target chemicals at their MASs-S minimal, 1-14 day effect levels to determine their performance under these conditions.

16. Environmental testing and hold testing were combined into a matrix of tests that look at the parameter of temperature, humidity, and hold time. The challenge conditions (temperature and humidity) were chosen to approximate the "real world" conditions of (1) Saudi Arabia, (2) Guam, (3) the Balkans (Kosovo/Yugoslavia area). Runs were done at both the MAGs-S minimal and significant effects levels for the respective chemicals. These levels were chosen to reduce the amounts of tests needed, but still be able to determine trends in sampler performance due to temperature, humidity, and the effects on hold time performance. If possible, a mixture of these chemicals was used at once to reduce the required number of experiments. Each of these sampler was put through hold testing by analyzing a statistically viable amount of the samplers at times of 2 weeks, 4 weeks, 6 weeks, and 8 weeks.

It is understood that this experimental design did not take into account trial-to-trial nor test-to-test variability, although sources of error were identified and are reported upon. This limitation was accepted to maintain the smallest trial quantity to maintain schedule and cost reasonableness.

3.4 Test Equipment

A schematic of the test equipment is shown in Figure 3.2. Chemical agent was generated into a humidified vapor stream by passing dry air through a diffusion tube to allow a controlled rate of agent to be vaporized into the air. A second stream of air was humidified by passing this air through a humidifying device. The two air streams were then blended and piped to the test chamber through stainless and silicon coated steel lines.

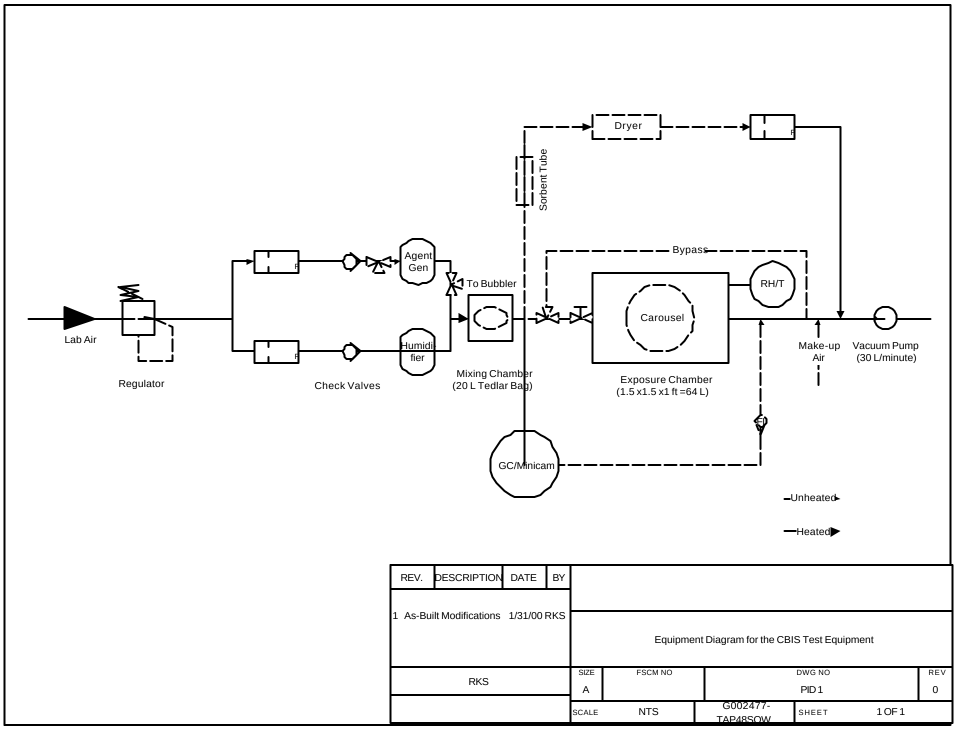


Figure 3.2 Laboratory Test Apparatus

A 14-inch diameter by 10-inch tall circular chamber was used as the exposure chamber. This chamber, shown in Figure 3.3, was fitted with a carousel for the samplers so that the air containing agent could be passed across the face of the sampler at a controlled face velocity. The samplers were hung in the chamber (and can be seen through the openings in the cauousel) using twist ties in an orientation as close as possible to actual wear configuration while still conducting an effective test.

The agent-containing gas flowed through the chamber at approximately 10 liters per minute. This flow rate was necessary to assure that the air, which contains agent in all areas of the chamber would be approximately equal to the challenge concentration. The flow, coupled with turning the carousel by a motor, provided fresh agent continuously to the surface of the sampler; the samplers would have no induced gas flow (i.e. no pressure differential across the sampler would be introduced so that flow from the bulk gas into the sampler occurs only by diffusion).

The carousel was rotated at a speed to give a face velocity (tangential flow to the diffusion screen) of at least 20 LFPM. The face velocity of 20 LFPM was chosen based upon SKC recommendations. All vendors were asked for minimum face velocity information but SKC was the only vendor that did respond to a request for this information.

Prior to challenging the samplers, the challenge air was brought to equilibrium in a by-pass mode. Once the agent concentration, humidity, and stream temperature were stabilized, the challenge air was introduced to the test chamber. A GC with gas loop was used to determine high concentrations (IDLH) and for determining agent concentrations in various parts of the system prior to challenge (range finding). Sorbent tubes (filled with Tenax) were used for low-concentration (TWA) agent determination. For low concentrations, gas samples were collected from the entrance and exit gas flow streams to the test chamber during testing to provide actual agent exposure concentration measurements that are within +/-25 percent of the expected concentration. Low concentrations approximations were measured using the MINICAMS. Actual concentrations during testing were measured in duplicate by passing a known flow rate of air from both before and after the chamber through a Tenax GC® sorbent tube, adsorption of the agent on the Tenax®, desorption from the Tenax® on the ATD-400, and analysis of the gas by GC-FPD .

The chamber temperature was controlled through heating pads that were applied to the chamber exterior. A Hobo data logger attached to the chamber lid monitored chamber temperature and humidity. A DC motor was attached to the carousel shaft on the chamber exterior to rotate the carousel at the required rate.

The Shimadzu and the ATD-400 were used in phases I and II as the analytical device. They are shown in Figure 3.4. The ATD-400 is a device that uses heated gas to pass through a sorbent-filled tube to remove the agent (and regenerate the sorbent). Up to 50 tubes can be placed on the ATD-400 at one time allowing the tubes containing the sample to be analyzed, calibration standards, and samplers to be analyzed as a batch. The ATD-400 has a focusing tube (containing Tenax TA in this program) to collect the agent a second time This tube is then thermally desorbed into the GC column.

The Shimadzu gas chromatograph was used as the detection device in the first two phases and for the first two field tests. This chromatograph is a compact device with its own data system that can be fitted with dual FPD or an FID as well as other detectors. The Shimadzu and FPD were used in this program because the amount of agent that would be adsorbed and released at the GD AEL (0.00002 mg/m3) was not known but based on expected flow rates and allowed exposure times was believed to be in the range that required an FPD to detect.

Figure 3.3 Exposure Chamber Showing the Carousel for Sampler Operation and Hanging Wires With Samplers Attached

Figure 3.4 ATD and Shimadzu GC-FPD

The initial design of the SKC sampler in its original configuration could not be regenerated directly on the ATD-400. For this reason, in Phases I and II each badge was regenerated by using a TDSorb, shown in Figure 3.5. The TDSorb is a device that is designed for collecting contamination off diverse materials such as hard drives and placing that contamination on a P-E

tube. The TDSorb consists of a heated chamber through which heated humidified gas is passed. The gas is air cooled and is collected on a P-E Sorber. The P-E Sorber is then analyzed on the ATD-400.

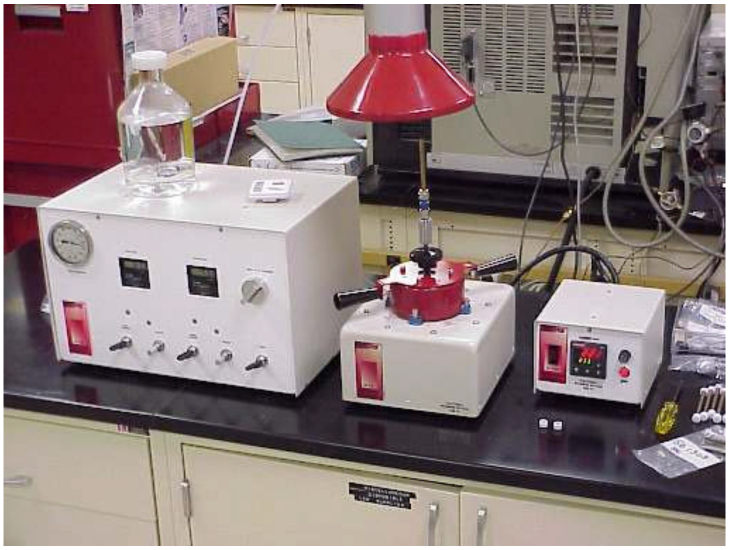


Figure 3.5 TDSorb Apparatus

The primary analytical instrumentation for the additional laboratory studies program phase was attached to an ATD-400 Thermal Desorber that is attached to an Agilent 6980 GC with an Agilent 5973 mass selective detector, (Figure 3.4).

Figure 3.6 ATD-400 Attached To an HP 6890 GC with HP 5973 MSD

The items shown in Table 3.1 were used during testing and configured to form the test fixture. These items are in addition to the three samplers.

Table 3.1 Test Equipment

Item	Use
Diffusion tube	Agent concentration generator
Humidifier	Humidity generator
Exposure Chamber	Exposure of samplers
GC with Gas Loop	Agent concentration indicator at IDLH levels
Tenax tubes	Agent concentration indicator at TWA levels
TDSorb	Desorption system for SKC 575 samplers onto a Tenax tube
ATD-400	Desorption system for PE Sampler, GoreSorber, and Tenax collection/desorption tubes
Flow controllers	Controlled the flow of gases throughout the system
Refrigerator	Refrigerate the samples
PE Sampler Holders	A special holder to prevent exposing the PE Sampler exterior surfaces to agent.

3.5 Test Conditions

In Phases I and II, the samplers were challenged with a mixed gas air stream containing chemical agent vapor and humidified air. Chemical agent vapors were generated using a diffusion tube to generate vapor concentrations. The agent-containing air was mixed with humidified air to reach 20-40 percent relative humidity for the total stream. This allowed for some humidity, but, based upon experience of the researchers, it is considered low enough that it did not affect agent hydrolysis in the system. The air stream to the test chamber was temperature controlled only for HD (50 to 55 ^{o}C), the temperature for the remaining trials were not heated and was near laboratory ambient temperature of 19-23 ^{o}C.. Normal laboratory temperature fluctuations are on the order of 4 ^{o}C, which was not considered enough to justify adding temperature control to the challenge system.

The additional laboratory testing was done at two different locations for the compounds listed in Table 3.2. The Hazardous Material Research Center (HMRC) of the Battelle Memorial Institute performed all testing that involved nerve and blister agents as well as several of the TICs. The Occupational Safety and Health Administration Technical Center at Salt Lake City also

performed work on other TICs. Trimethylbenzene was used as a common material between the labs for comparison purposes.

The agents and TICs used are listed in Table 3.2 along with the laboratory they were used in. The MAGs-S levels are listed for reference purposes.

Table 3.2 Chemicals Of Interest With TG-230a Levels

	1 Hour MAGs-S Levels in (mg/m^3)				**1 – 14 Day MAGs-S (mg/m^3)**
	Name	**Minimal Effects Level**	**Significant Effects Level**	**Severe Effects Level**	
Battelle Analyzed Chemical Agents and TICs	Acrolein	0.23	1.15	6.9	0.023
	n-Butyl isocyanate	0.04	0.2	4.1	Not determined
	Phosgene	0.4	0.81	4	0.04
	Soman (GD)	0.003	N/A	0.05	0.000003
	Sulfur Mustard (HD)	0.42	N/D	1.7	0.003
OSHA Analyzed TICS	Benzene	160	479	3195	0.16
	DDVP	N/A	N/A	N/A	N/A
	Ethyl Benzene	542	542	3474	43
	(R)-+-Limonene	N/A	N/A	N/A	N/A
	Tetrachloroethylene	N/A	N/A	N/A	N/A
	Trimethylbenzene	N/A	N/A	N/A	N/A
	Undecane	N/A	N/A	N/A	N/A

Phosgene was included in the test matrix because of its dual use as an industrial and military compound, but it was anticipated that it would be problematic for both adsorption on the sampler and in analysis by GC-MSD.

Both the Gore and SKC samplers require a minimal face velocity in order to achieve mass transfer from the atmosphere into the packet (as noted, this information is not known for the Gore, but will be developed as part of study).

3.6 IPCS Analytical Operations

A Perkin Elmer ATD 400 interfaced to either a HP 6890/5973 MSD or an Agilent 6890/5973 MSD was used for all sample analysis. A 30 M x 0.23mm i.d., 0.25 um df gas chromatography column was used for analysis. The column was temperature programmed from 10 to 280 C at 20 C/min. The MSD was scanned from 45 to 450 amu.

3.6.1 Standard Preparation

Standards are prepared from neat compounds at 1 mg/mL in methanol (except agents). Agents are prepared in hexane and stored at ≤ -20 °C and viable for 6 months. Methanol stocks are combined and further diluted in methanol. Methanol standards are stored at ≤ 4 °C and viable for 6 months. Clean Gore pillows were used for preparing calibration standards. Gore pillows are cleaned by placing them into tubes and heating them at 275 °C under 100 mL/minute of helium flow for 10 minutes.

Two microliter volumes of mixed standard are injected into Gore pillows to produce calibration standards at various concentrations. Internal standard (IS) is added via a gas sample loop for standards run splitless. For standards run split, liquid IS solution prepared in methanol is injected directly into the pillow before it is put into the tube.

To spike the pillows they are placed on a clean surface and held down with a gloved hand or tweezers to prevent the pillow from rolling. Great care was taken to not push all the way through the pillow with the syringe. The pillows were then loaded into the tubes with tweezers.

3.6.2 Sample Preparation

Gore samples are removed from their packet by peeling the packet apart using tweezers. Using tweezers one of the pillows is dropped inside an empty tube, which contains a properly seated gauze disc (screen). The other pillow remains inside the packet in the glass sample bottle.

Internal standard (IS) is added via a gas sample loop for samples run splitless. For samples run split, liquid IS solution prepared in methanol is injected directly into the sample pillow before it is put into the tube. In the case of SKC samples the IS is injected onto the sorbent after it has been placed into the tube configuration.

The Gauze-loading Accessory (P/N L407-0023) is available from Perkin Elmer for their tubes. This is a critical piece of equipment to have because proper seating of the gauze discs are required to keep the Gore pillow or SKC Tenax from blowing out of the tubes.

It takes two people approximately 2 hours to prepare a rack of 50 tubes (samples and standards). It takes 1 person approximately 6 hours to prepare a rack of 50 tubes (samples and standards). This preparation includes tuning the mass spectrometer and setting up all of the data files.

3.6.3 Sample Analysis

The ATD 400 can run 50 tubes unattended. The 50 tubes are comprised of 35 actual samples, a 5-point calibration curve, 7 continuing calibration standards and up to 3 blanks (blanks are empty tubes). Turnaround time per tube is approximately 30 minutes or 25 hours per rack. Cryogenic cooling (liquid nitrogen) is required to operate the system and maintain this turnaround time.

Instrument maintenance is critical to keeping samples running efficiently. Routine maintenance is performed as needed usually every 200 samples or once a week. This includes replacing the trap in the ATD, replacing all of the o-rings that seal the tubes and cleaning the mass spectrometer monthly. The GC column is replaced every 3 to 6 months.

3.6.4 Data Review

Data review can be extremely difficult and time consuming even with a target analyte list and an experienced analyst. Aside from the target analytes many other compounds are captured on the Tenax as well as breakdown products of the Tenax. Precleaning the Tenax cuts down on the

background tremendously and increases the speed at which an analyst reviews the data. Assuming a target analyte list of 5 compounds and 50 runs it takes approximately 4 to 6 hours to work the data up and another 1 to 2 hours of peer review resulting in approximately 8 hours of time to turnaround 50 tubes.

After every fifth sample, a quality control check standard was analyzed and was usually within 25% of theoretical. Most often when the QC check were outside of 25% theoretical it was usually a result of large amounts of contaminates on the sorber which remained in the analytical system. Often, because the entire sample was desorbed into the GC, there was no sample remaining for a second analysis.

4.0 EXPERIMENTAL AND RESULTS

All test samplers were purchased and stored in their original containers at ambient conditions. SKC are sealed with a cap and individually heat sealed inside a metallized plastic bag. Bags were overpacked in paperboard boxes. Gore samplers were received inside individual 40 milliliter glass vials with a Teflon lined cap. The vials were packaged inside a cardboard box tat contained small sorbent packages. Unused samplers were kept in an office area to minimize potential chemical contamination prior to use.

4.1 Minimum Detection Limits

This experiment determined the IDL and MDL for the chemicals listed in Table 3.2 (MES will be included as well because of its presence in one field test). A problem with using the conventional definitions of IDL and MDL is that they typically are based on the noise level of the measurement, and mass spectra are essentially noiseless. Thus, an artificially low IDL and MDL will be found. In addition, the establishment of the MDL requires not only signal response, but also mass spectral quality. Ideally the MDL is reached when the signal-to-noise for the least abundant ion is approximately 3 to 1 and the following criteria can still be met:

- All ions present above 10 % relative abundance in the standard mass spectrum should be present in the sample (in this case the sample is the standard that is just at 3:1 S/N or where there is no noise)
- The absolute abundance of the ions in the standard mass spectrum should agree within 20% in the sample mass spectrum.
- Some ions such as the molecular ion are of special importance and should be evaluated even if they are below 10%

Additionally, the above criteria need to be met when there is no noise.

Initially the IDL was determined by liquid injection. Various concentrations of the analytes in methylene chloride were injected. These MDL values were determined.

A specific IDL was not conducted because the GC-MSD was already configured. The MDL was conducted on the system so a system MDL was determined. Seven replicates of Tenax tubes were vapor spiked at 1 and 2 ng. Acrolein concentrations were 100 times higher and butyl isocyanate concentrations were 10 times higher. The 14 replicates were analyzed with a five-point calibration curve run immediately before and after the replicates. A MDL was also run for GD in the selected ion monitoring mode (SIM) in effort to improve the MDL for GD in SIM was 0.42 ng.

The results from this work are listed in Table 4.1. To allow inter-laboratory comparisons, both Battelle and the OSHA Technical center evaluated the same set of compounds (with the exception of nerve agents). Also included in Table 4.1 are USACHPPM's MAGs-S 1 hour standards. Loadings expected in the IPCS samplers after one-hour of exposure at the MAGs-S minimal effects level, assuming a diffusion rate of 40 mls per minute and 100% absorption efficiency (that is, all material that comes in contact with the sampler is absorbed).

Table 4.1 MDL's Found for Agents and TICs with Comparison to MAGs-S Minimal Effects Expected Sample Quantities

Compound	MAGs-S at S-hour Mimimal Effects Exposure (ng/L air)	Found MDL (Tube Loading in ng)	Tube Loading after 1 hr at MAGs-S minimal Level (ng)
Acrolein	100	56	240
Benzene	50,000	0.87	120,000
Butyl isocyanate	10	27	24
Dichlorvos (DDVP)	Not Available OSHA =	1.25	Not Available
Ethyl Benzene	125,000	0.07	300,000
GD	3.0	1.21	7.2
HD	420	0.86	1008
Limonene	Not Available	0.64	Not Available
Methyl Salicylate	Not Available	0.81	Not Available
Trichlorobenzene	Not Available	0.21	Not Available
Trimethylbenzene	Not Available	0.08	Not Available
Undecane	Not Available	0.11	Not Available

Phosgene was evaluated separately, due to concern that it could degrade the instrument. Neat phosgene was removed from a cylinder and placed in a Teflon sampling bag. Net phosgene, 200 uL, was applied to a Tenax tube while flowing, a total of 5 L of air (at 500 mL/min) through the tube (`875 ug calculated). We were able to detect phosgene at approximately 875 ug. A gastight syringe was used to remove 1 mL of phosgene from the Teflon bag and slowly injected into 1 mL of methylene chloride contained in a capped GC vial. This solution was injected onto a Tenax tube and analyzed on the ATD. We were not able to detect phosgene in this sample at approximately 20 ug. No further work was done with this compound.

The results suggest that this combination of Tenax absorbent, analytical instrumentation and analytical conditions is capable of detecting the desired compounds at the levels required except for phosgene GD and acrolein are very near the MDL.

4.2 Alternative Sorbents

Two other sorbents were tested in this program. Carboxan, a more carbon-like sorbent was tested. Other candidate sorber configurations, particularly those of other materials or design were tested to the extent that time in the schedule (e.g. between other samples), space in the test

apparatus (e.g. open sample points), and test budget permit. These included the GoreSorber with Carboxen. These items were obtained in small quantities and tested in limited tests during this phase of the program. The fact that no agent was seen on the Carboxen® sorbent indicates that this sorbent was unsuitable for the adsorption and thermal generation parameters that Tenax® showed to be successful.

Supelco recommended a different sorbent material, Carbopack X ®. This material was evaluated as another possible IPCS sorbent material. ATD tubes were packed with Carbopack X and Tenax TA. These tubes were pre-conditioned prior to use at 250 C, under a flow of helium at 10 mL/min for 15 minutes.

These tubes were spiked with both CWAs and selected TICs at the 2, 5 and 10 ng. Blank Carbopack X was also analyzed. Spiking was done in at least duplicate under ambient conditions using the same method as before. The tubes were analyzed against standard spiked Tenax tubes prepared as described previously Benzene exhibited an enhanced response as compared to Tenax. Recoveries of the Benzene when compared to the Tenzx ranged from 105 to 204%. All of the other compounds exhibited no response when spiked at 2, 5 or 10 ng. Except ethylbenzene which was recovered between 10 and 35% depending on spike level. Neither GD or HD were detected and no further work was attempted with this sorbent.

4.3 Badge Capacity

This tested the capacity of the Gore Tenax absorbent. Capacity, in this instance, does not refer to how much material can be physically absorbed into the Gore sampler; rather, this tested how much of an interferent can be added to Tenax® and still obtain reasonable analytical results. GD and HD were used as the test analytes and methyl salicylate (MES) was used as the interferent. The loading of agent was held constant at 10 ng throughout the experiment. loadings of MES at 100 ng, 300 ng and 1 mg were used as interferent levels. The lower loadings of MES are within an order of magnitude of some of the material loadings seen from the samplers deployed in the field exercises.

Capacity tests were performed to determine at what point the badge will no longer retain GD or HD when the badge is loaded with various amounts of other components. GD and HD concentrations were kept constant at 10 ng and MES was used as the interferent. Challenge concentration of MES ranged from 100 ng to 100 ug. All agent and MES were applied using liquid injection into the sorbent.

Capacity was evaluated by choosing a peak from the chromatogram (MES) with a retention time that eluted after the agent peaks so not to impair the detectability of the agent by chromatographic overload. The recover of agent was determined as the amount of MES was increased. The initial capacity tests were performed on both unconditioned Tenax and GoreSorbers. When additional capacity samples were analyzed only conditioned Tenax tubes and GoreSorbers were available in the needed quantity to continue the capacity runs. It was at this point that the recoveries of the agents improved remarkably in comparison to the earlier analyses. The difference was conditioning of the sorbent.

The HMRC prepared and analyzed three unconditioned GoreSorbers. They were spiked with 10 ng each of GD and HD and 500 ug MES. Average GD recovery was 8% and average HD recovery was 44%. A summary of the capacity samples is presented below.

Based on the results of the unconditioned sorbents, the capacity of the sorbents is less than 300 ug. Based on the conditioned sorbent results, the capacity of the sorbents appears to be greater than 500ug/40ug of sorbent.

Table 4.2 Summary of Capacity Samples

Sorber Type	Conditioned	MeS Conc. UG	GD/HD Conc NG	Average % Rec. GD	Average % Rec. HD

Sorber Type	Conditioned	MeS Conc. UG	GD/HD Conc NG	Average % Rec. GD	Average % Rec. HD
Gore	No	0.1	10	112	95
Gore	No	0.3	10	49	66
Gore	No	300	10	3	0
Gore	No	1000	10	0	0
Tenax	No	0.1	10	35	79
Tenax	No	0.3	10	103	133
Tenax	No	300	10	4	0
Tenax	No	1000	10	0	0
Gore	Yes	1	10	95	92
Gore	Yes	100	10	96	91
Gore	Yes	500	10	78	78
Tenax	Yes	0.1	10	108	106
Tenax	Yes	1	10	103	96
Gore*	Yes	500	10	79	95
Gore**	No	500	10	8	44

N=7, *n=2, **n=3

The results suggest that interference does occur at relatively low loading levels but there is a lack of consistency. Figure 4.1 shows these results graphically. Areas below and left of each line show the estimated "safe" area where chemical agent will still be collected quantitatively despite badge loading. Also plotted on the curve are some of the more prevalent chemicals that the IPCS will have to work around. Note that the SKC has a predicted ability to work in higher backgrounds primarily because the quantity of sorbent is much greater than the SKC sampler while the apparent flow rate is lower. These attributes will help this sampler function more effectively in the battlefield. More detailed capacity evaluation has been performed on these samplers by OSHA and is summarized in their forthcoming report.

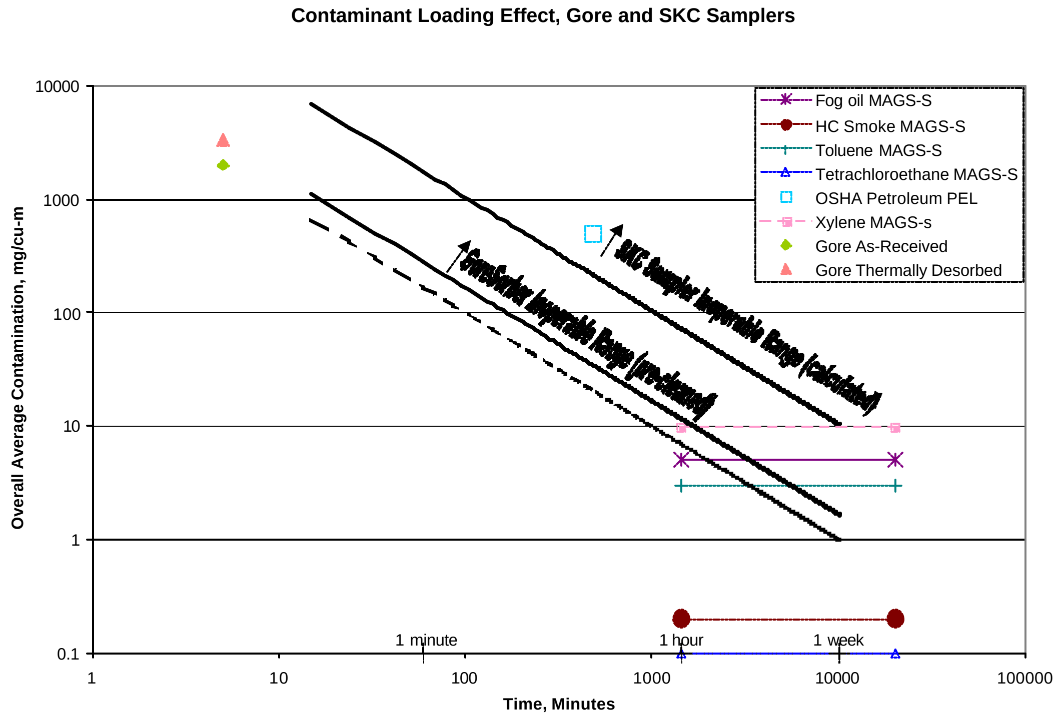


Figure 4.1 Capacity Loading Estimates for the IPCS Candidate Samplers With Selected Environmental Contaminants

4.4 Environmental And Hold Time Testing

This was combined into one test matrix. The Gore and SKC samplers were exposed to two levels of concentration based on the MDL and on the MAGs-S levels to an atmosphere with GD, HD, TMB and DDVP. The samplers were dosed at different temperatures and humidities to simulate exposure in temperate and extreme conditions, based on likely deployment areas. These are listed in the Table 4.3 below:

Table 4.3 Chamber Conditions for Exposure Studies

Chamber Conditions for Exposure Studies

Condition	Temperature	Relative Humidity	Location Simulated
Ambient	24 – 28 ºC	23%	Baseline
High Temperature and Humidity	30 – 36 ºC	80%	Tropical
High Temperature, Low Humidity	40 – 44 ºC	22%	Desert

Because of the sampler capacity of the carousel, three different exposure runs were required to prepare a sufficient number of samplers for the total holding times. In the typical experiment, the carousel was loaded with Gore and SKC samplers in alternating positions. For safety reasons the air flow containing the agents and TICs was set so that it by-passed the chamber during loading. Once the carousel was loaded and sealed the airflow was redirected into the chamber. Three Tenax tubes were drawn from the chamber exhaust so the concentration levels could be verified. These tubes were drawn under the temperature and humidity conditions of test and are thus an accurate reflection of the chamber exposure atmosphere. The first of these tubes was drawn beginning immediately after the airflow was re-established and then 15 and 45 minutes later. These tubes were drawn for a 5-minute at 0.5 liters per minute.

The carousel was rotated for one hour in this test atmosphere. Rotation rate was 19 revolutions per minute, which was equivalent to a linear face velocity of 80 linear feet per minute. This is well above the known and projected minimum face velocities required by the samplers. Because the chamber airflow was redirected away from the chamber there will be a period of time required before the chamber is re-established back at to desired challenge concentrations. Realistically, this would occur after between 3 and 5 complete air exchanges, which would require between 9 and 15 minutes. The data from the Tenax tubes strongly suggests that the chamber challenge concentrations were indeed re-established and stabilized after 15 minutes.

Tenax tube data for the individual exposures are shown in the Table 4.4 below.

Table 4.4 Exposure Conditions for Humidity and Temperature Variation Studies

High Concentration Ambient Temperature and Humidity

Run	Time After Start (minutes)	DDVP (ng)	GD (ng)	HD (ng)	TMB (ng)
1	0	613	78	2522	460
	15	1003	103	3626	698
	45	1127	108	3899	716
2	0	688	78	2515	487
	15	868	106	3797	708
	45	857	103	3597	704
3	0	727	71	2424	456
	15	789	103	3829	759
	45	904	101	3749	729

High Concentration High Temperature and High Humidity					
Run	Time After Start (minutes)	DDVP (ng)	GD (ng)	HD (ng)	TMB (ng)
1	0	540	91	3023	794
	15	550	80	2047	606
	45	293	71	2213	631
2	0	239	62	1339	436
	15	282	69	2240	644
	45	290	81	2111	531
3	0	239	57	1478	439
	15	251	66	2192	591
	45	199	62	2253	607

Low Concentration Ambient Temperature and Humidity

Run	Time After Start (minutes)	DDVP (ng)	GD (ng)	HD (ng)	TMB (ng)
1	0	13.2	19.22	9.12	N/A
	15	NR	NR	NR	
	45	7.82	26.2	13.0	
2	0	11.0	18.5	9.78	
	15	7.72	23.0	11.6	
	45				
3	0	10.9	23.1	8.2	
	15	6.99	23.8	9.49	
	45	6.35	24.9	10.0	

Low Concentration High Temperature and Low Humidity					
Run	Time After Start (minutes)	DDVP (ng)	GD (ng)	HD (ng)	TMB (ng)
1	0	13.0	14.7	10.8	
	15	10.4	20.4	15.9	
	90	11.0	22.4	16.0	
2	0	10.2	13.8	11.4	
	15	9.46	21.2	15.8	
	90	9.67	20.7	15.1	
3	0	9.77	20.8	15.8	
	15	7.42	19.5	14.2	
	90	8.06	22.0	15.4	

Figures 4.2 and 4.3 show the results for nanograms of material recovered as a function of days after testing. The error bars shown in the figures represent 99 percent confidence level estimations based on the Student t-test. Where the y-value error bars overlap, the data are possibly the same based upon the confidence interval. Where they do not overlap, the data are likely different.

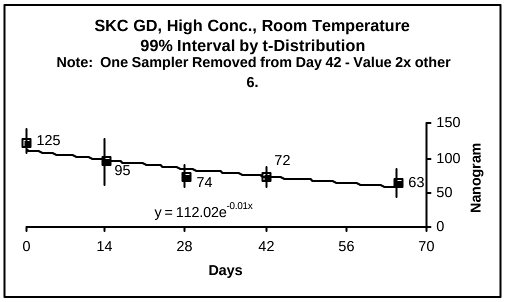
While the data error bars tend to indicate that the data could also be the same value (e.g. that the standard deviations of data are large enough that the decline could be an artifact), the curve fit

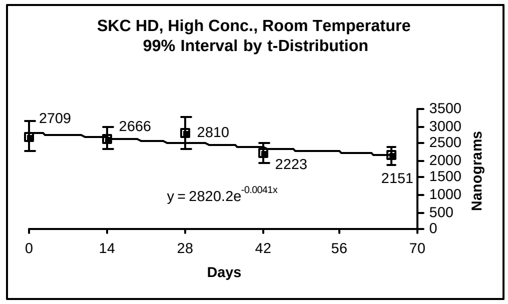
for the average data tend to show a decline in concentration over the hold time period. Based on a consistent declining trend, it appears that there is degradation of most sample material that is occurring on the samplers as they are held.

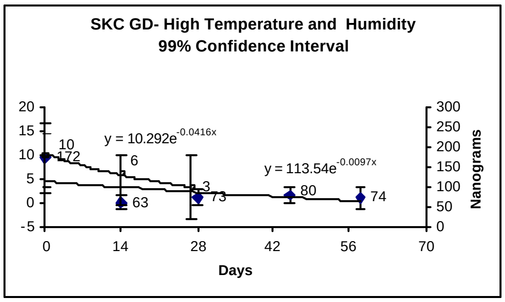
The experiments where the exponent is positive are not considered because there is no mechanism that should increase the amount of sample on the sampler. The exponent for the decay equations varies from about –0.001 to –0.022 days^{-1} assuming a first-order mechanism. The inverse of this exponent (e.g. -1000 for -0.001) is called a time constant (t), and represents the number of days over which 62.3 percent of the sample will decay. Because the goal of most industrial hygiene sampling is to analyze the concentration within 25 percent of the actual concentration, the maximum hold time goal is determined by the relationship

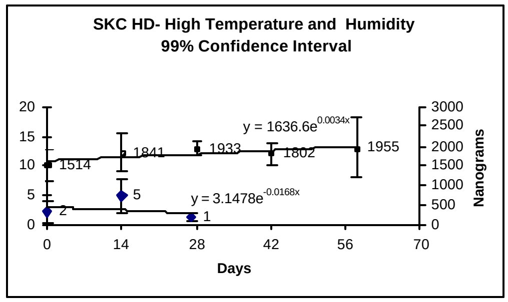
$$t/t = 0.288$$

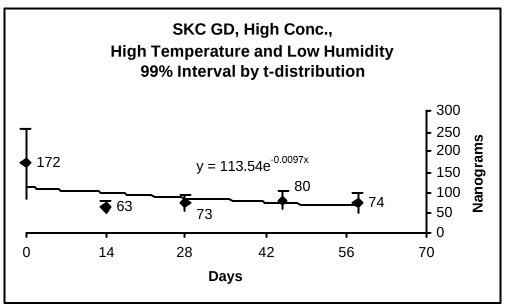
and t for the evaluated samples is 13 days where the exponent =-0.022 and 288 days where the exponent =-0.001. On this basis then, the highest decay rate for GD of –0.022 gives a recommended hold time for GD and HD that should not exceed 14 days at room temperature. Based on the results for TMB and DDVP it appears that samples being analyzed for these compounds only could be held for up to 28 days.











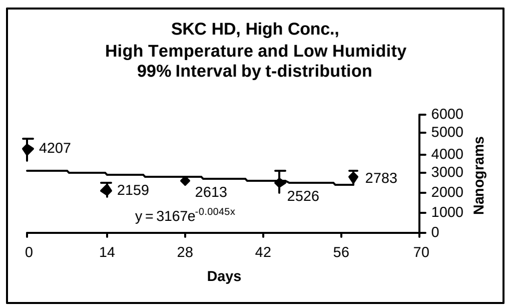


Figure 4.2a SKC Sample Recovery vs. Time Results for Agents GD and HD

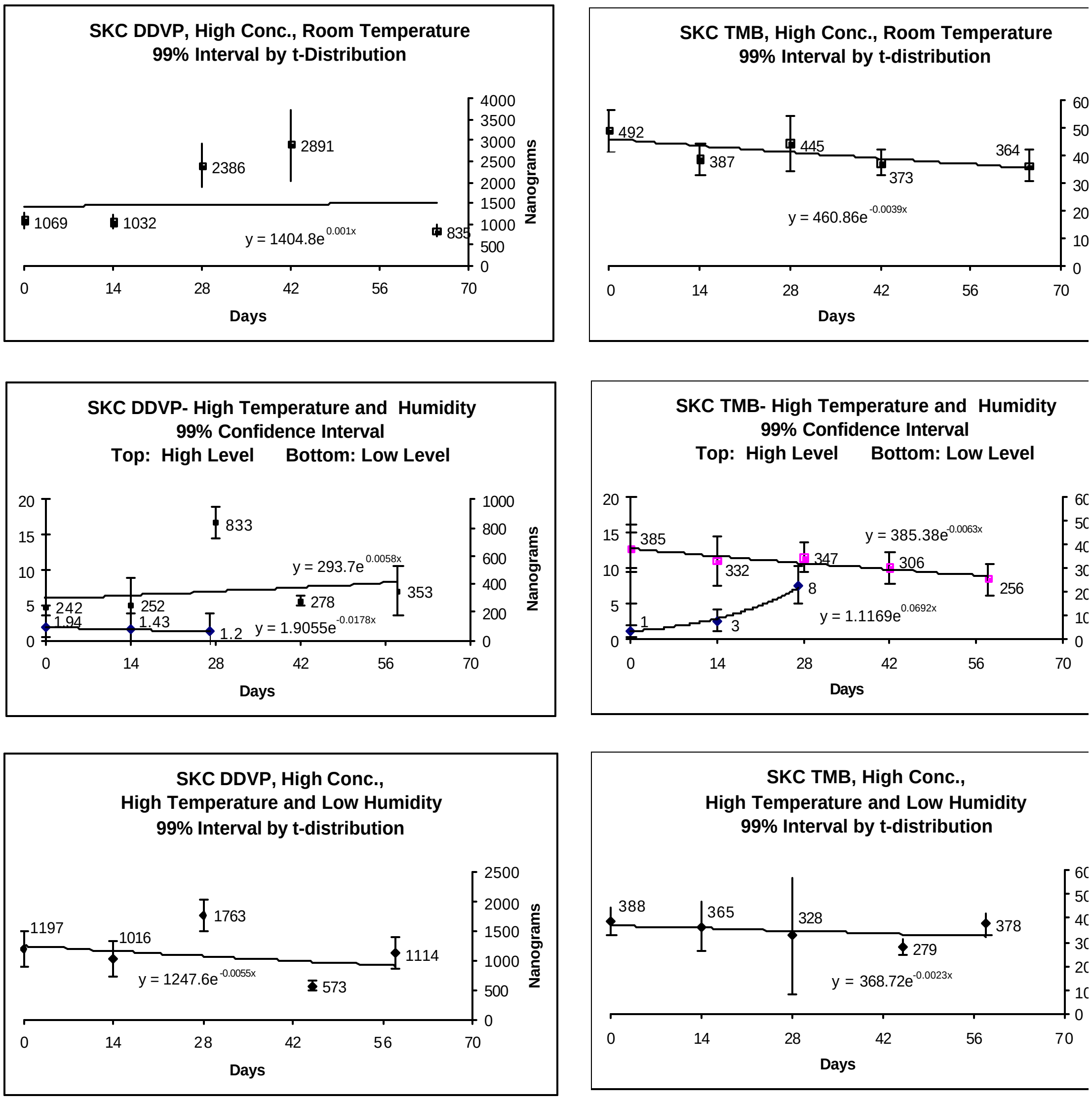


Figure 4.2b SKC Sample Recovery Results vs. Time for DDVP and TMB

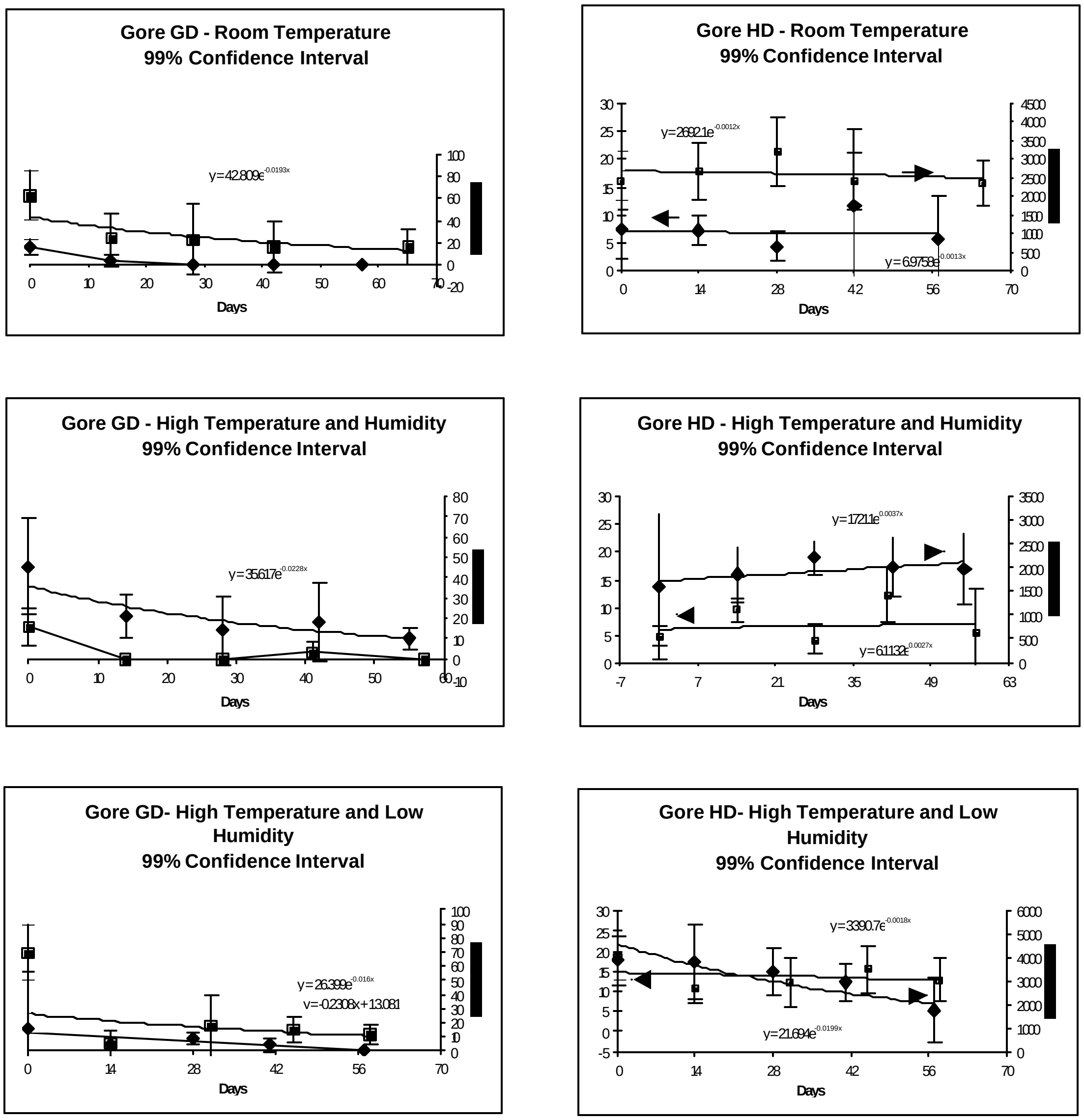


Figure 4.3a GoreSorber Sample Recovery Results vs. Time for GD and HD

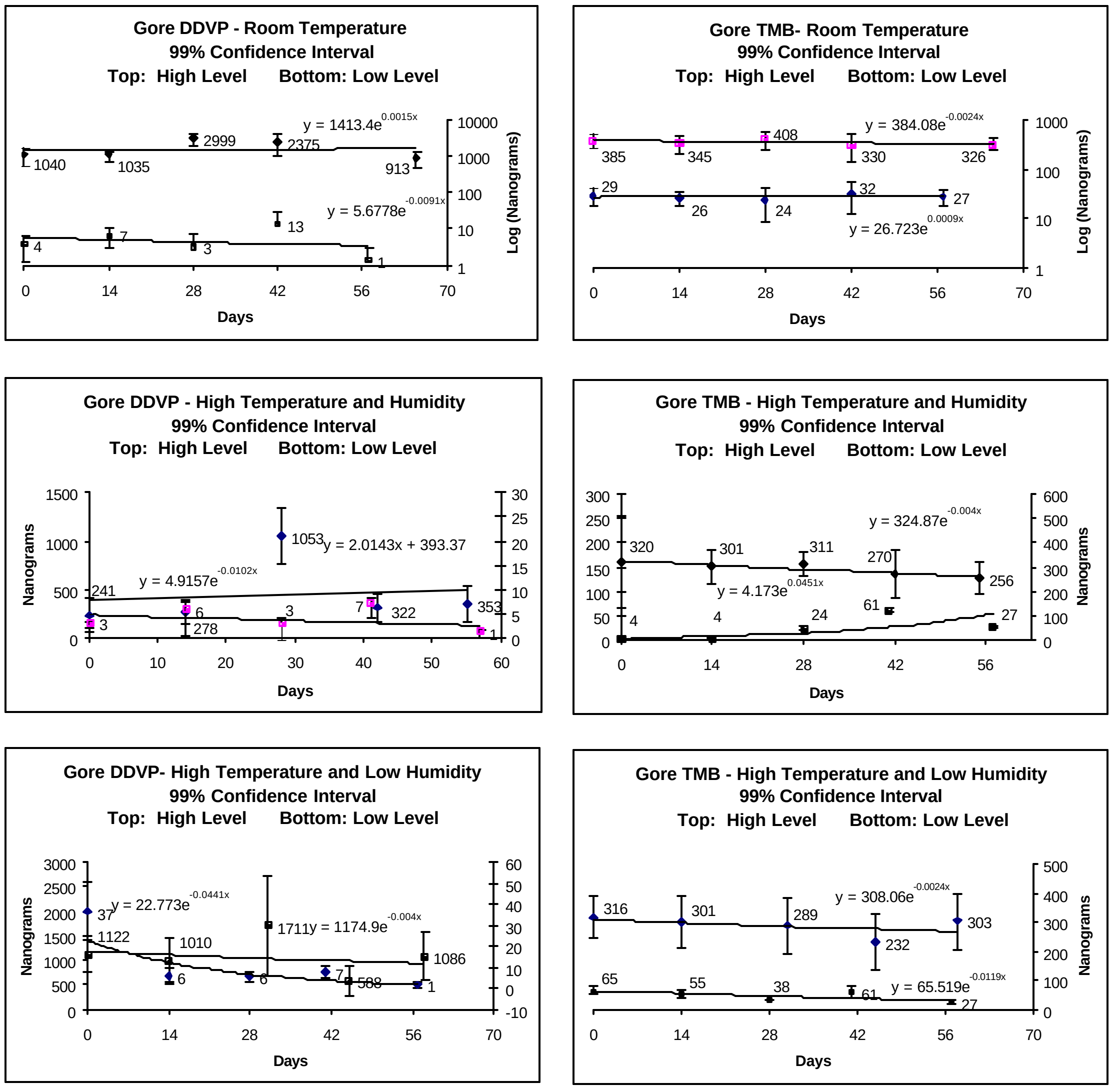


Figure 4.3b GoreSorber Recovery Results for DDVP and TMB vs. Time

Figure 4.6 shows the dependence of collection on humidity. Collection of both GD and DDVP is dependent on humidity based on this chart. On the basis of these results, there is a small but Figures 4.4 and 4.5 show the dependence of sampling efficiency on temperature. These data indicate that sampling rate is somewhat dependent on temperature for GD and HD, and that sampling efficiency for DDVP is variable depending on temperature. Because the relationship for DDVP appears to both increase and decrease vs. temperature, it is likely that there is another effect occurring here. One of the potential factors is humidity.

significant effect on sample collection efficiency due to humidity for GD. Surprisingly, there is no effect of humidity on collection of HD.

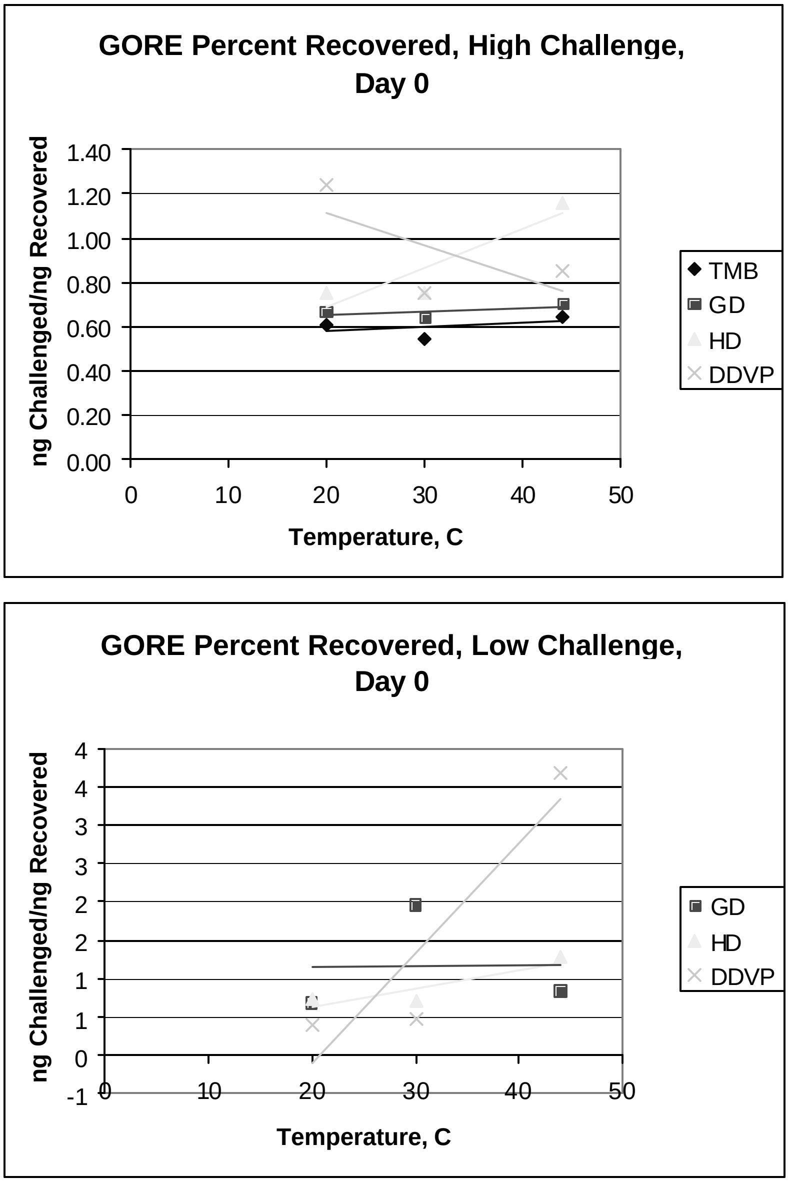
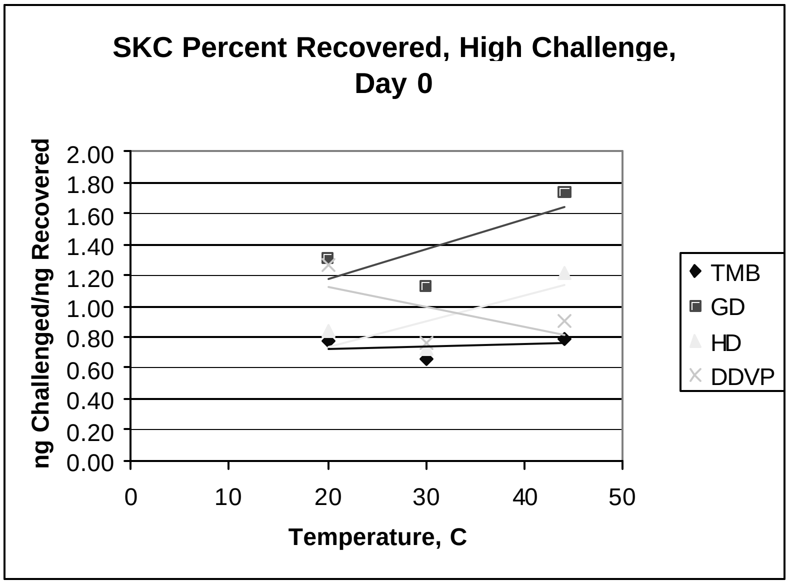


Figure 4.4 Day 0 Adsorption and Recovery Comparison Between Gore Low-Level and Gore High-Level Samplers at Varying Temperatures



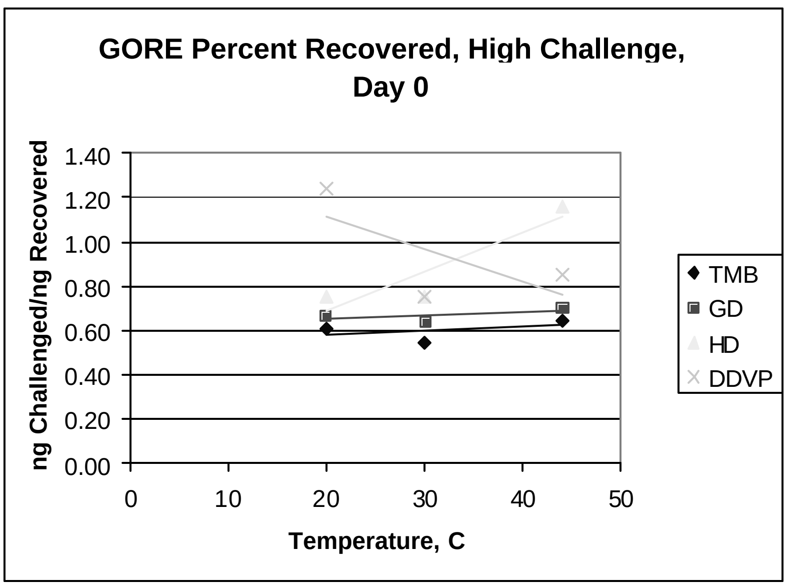
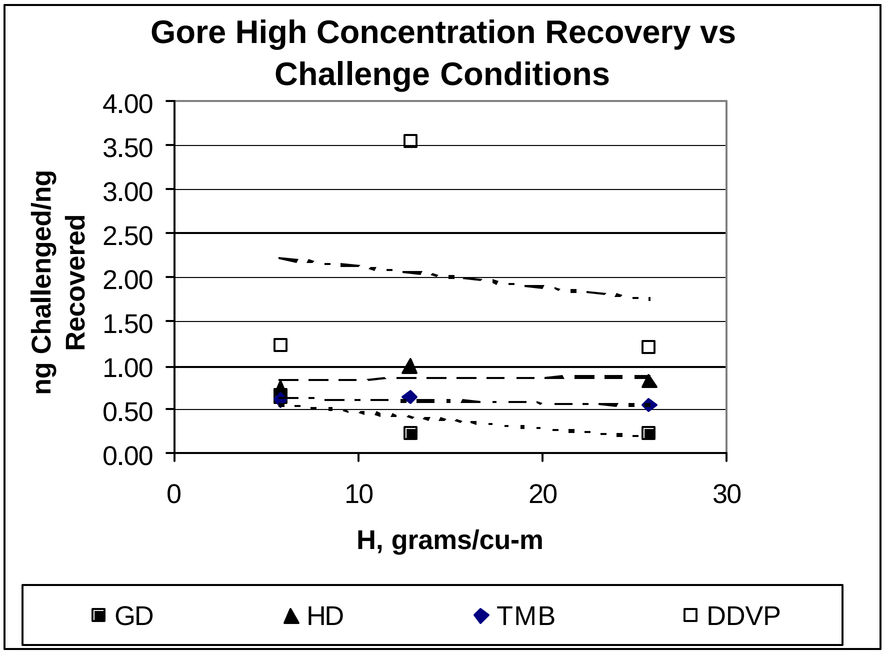


Figure 4.5 Day 0 Adsorption and Recovery Comparison Between SKC High Level and Gore High-Level Samplers



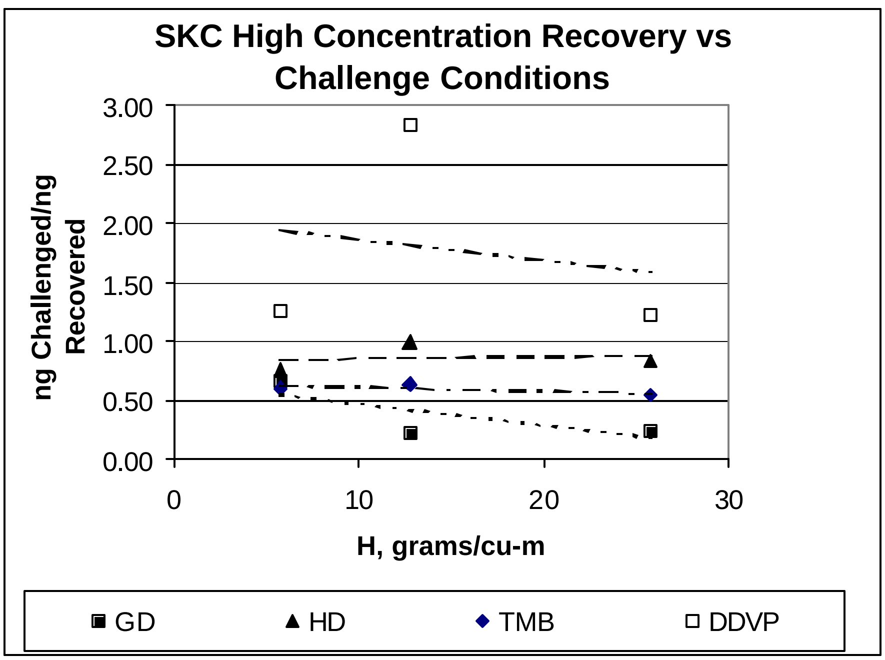


Figure 4.6 Sampling Dependence on Humidity for GoreSorbers and SKC Samplers

4.5 Face Velocity Testing

Adsorption capacity for a passive sampler is known to depend slightly on the chemical being sampled but is highly dependent on face velocity. Face velocity vs. uptake rate for the SKC Samplers was determined by OSHA for a variety of non-agent chemicals. Because their results were so independent of chemical sampled the OSHA results were used for the SKC sampler and chemical agents. The sampling rate used for the SKC samplers is 13 mL/minute at face velocity in the 20-60 ft/minute range.

The GoreSorbers have never been tested for chemical agent adsorption as a function of velocity for either chemical agent or other organic chemicals. To obtain the face velocity for the chemical agents, tests were run on the GoreSorber® at three different face velocities (20, 40, and 80 ft/minute).

The results of this test are shown in Table 4.5 and Figure 4.7. These results were obtained when challenging the GoreSorber with agent quantities at concentrations that were projected to yield about 3-5 times the MDL based on prior testing assuming that the uptake rate is only 10 mL/min. The samplers were challenged for one hour at the rotational velocity in the chamber that will yield the face velocity. The agent concentration of the chamber was sampled for five minutes twice during the exposure of each sampler.

The uptake rate is calculated by the following equation

$$V_{sampler} = \frac{m_{sampler}}{m_{challenge}} \bullet \frac{t_{challenge}}{t_{sampler}} \bullet V_{challenge}$$

$V_{sampler}$=*Apparent sampling rate of the GoreSorber®, ml/min*

m=quantity of chemical found, ng

t=challenge time, minutes (60 minutes for samplers, 5 minutes for challenge samplers)

$V_{challenge}$=*Volumetric sampling rate of the challenge samplers, ml/min (500 ml/min for challenge)*

The uptake rate for HD and GD are shown in Table 4.5 and Figure 4.7. In this figure, the quantity of agent HD appears to vary linearly across the 10-40 mL/minute range. The estimate for HD is in the 30 ft/minute range.

Table 4.5 Results of Face Velocity Tests with GD and HD

Sample	GD Avg, ng	GD Std Deviation, ng	HD Avg, ng	HD Std Deviation, ng
Empty Tube	0.00	0.00	0.00	0.00
Challenge	20.40	3.12	7.70	0.83
10 ft/min	0.98	1.02	6.20	0.74
20 ft/min	0.94	0.69	5.70	0.39
40 ft/min	0.42	0.56	7.54	0.72

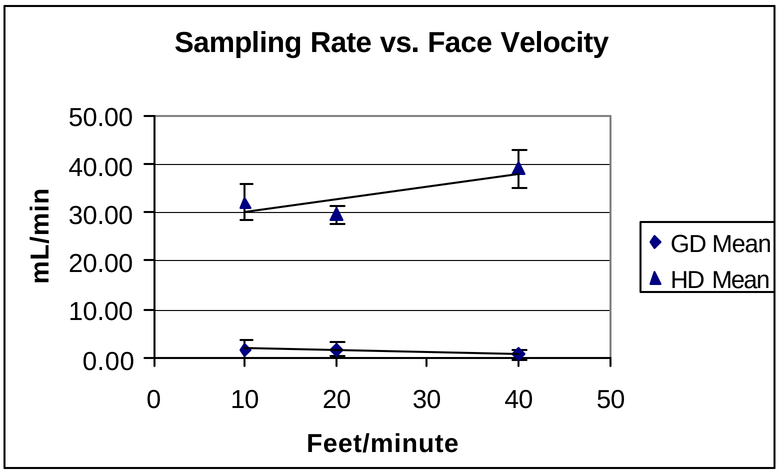


Figure 4.7 Results of Sampling Rate vs. Face Velocity for GD and HD

Additionally, the data from the Day 0 analysis of the challenges done at room temperature, 30 C, and 44 C were analyzed to determine the predicted face velocity. These data are shown in Figure 4.7.

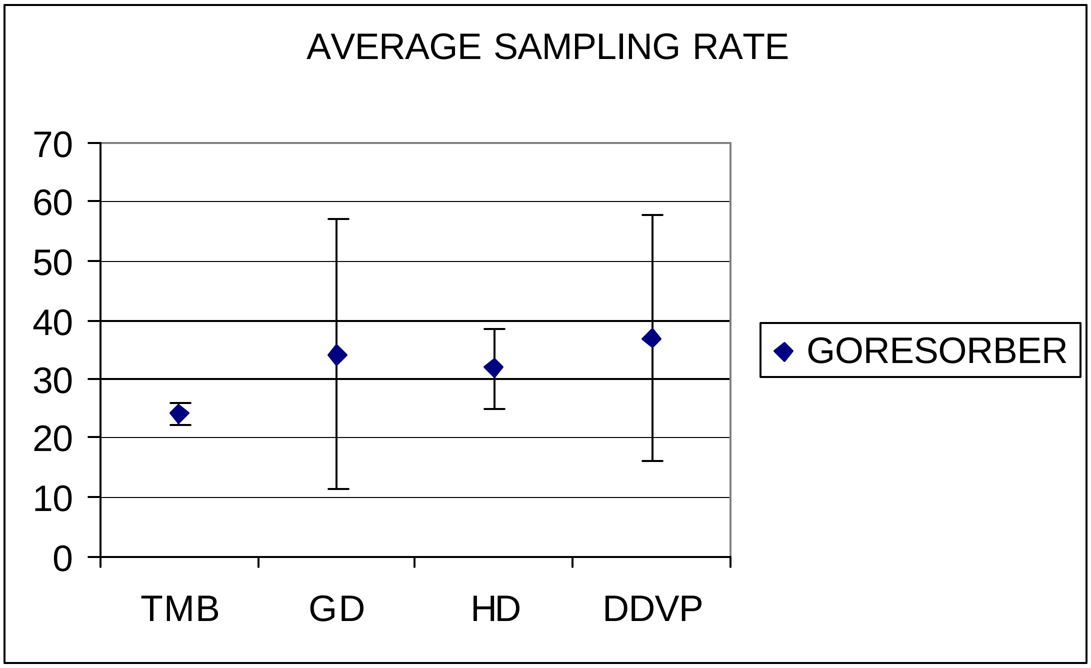


Figure 4.8 Sampling Rate Calculations Based Upon Day 0 of the Temperature and Humidity Test Results

The results from the specific velocity challenge test in Figure 4.7 showed a sampling rate between 32 and 39 mL/min for HD and 0.8 to 1.9 for GD. The results in Figure 4.8 show a similar velocity to that of Figure 4.6 for HD (31.5 mL/min) and a velocity of 33 mL/min for GD. The GD results from the velocity/time study in Figure 4.7 are questionable based on this testing and general sampler performance knowledge which both suggest a similar uptake rate for GD when compared to HD. The high error bands on GD in Figure 4.7 are indicative of two things occurring; first, the testing was conducted near the MDL, which increases the variability of results, and second, examination of the background contamination present on the samplers tested at varying velocity also indicates high loadings that were likely to interfere with GD uptake. For this reason the GD rate found in figure 4.6 is not used. The HD rate average of 31-34 mL/minute and the GD rate of 34 mL/min should be used for agent sampling rate by the GoreSorbers until other more comprehensive studies suggest a different value.

4.6 Interference Tests

As part of the test plan, interference testing was conducted to determine the effect of other chemicals could have in adsorption of agent. Some preliminary evidence of this interference is shown in Section 4.3, badge capacity and in the testing of GD in Section 4.5. Testing was still conducted despite these preliminary indications.

A group of chemicals was selected for interference testing. This group was based on background chemicals found in the field trials conducted at Fort AP Hill, Fort Benning, and on board the Iwo Jima. Concentrations selected were those represented by the OSHA PEL for the chemicals.

Agent concentrations and temperature and humidity were stabilized and measured in the challenge chamber. The temperature of the chamber ranged from 22-24C during the challenge period. The RH ranged from 45-47 percent RH. The interference concentration was metered in but was not measured in the chamber.

Agents GD, HD, and TICs of trimethyl benzene and DDVP were not detected on the GoreSorbers®, the SKC samplers, nor on the challenge tubes. This indicates that even relatively safe quantities of the TICs in the ambient air being sampled may cause loss of agent sample.

4.7 Manufacturing Support Studies

Previous work has assumed that the Tenax-containing samplers from Gore and SKC have a shelf life of up to two years. Shelf life is defined as a period of storage at ambient temperature/humidity in the original factory packaging without a degradation in sampler performance. The sorbent is one component that could degrade. Sorbent performance degradation takes the form of a reduced ability to absorb and hold a detectable quantity of target analyte due to background loading or an inability to distinguish the analyte quantitatively from the background.

Degradation in performance was first noticed with the SKC samplers during the hold-testing experiments using the low concentration challenge. Challenge levels previously able to be detected were not found on the samplers (the MDL was determined as described in Section 4.1).

5.0 CONCLUSIONS AND RECOMMENDATIONS

The HMRC has conducted additional testing on the selected sorbers, including system MDL, sorber capacity, comparison of other sorbents than Tenax TA, evaluation of an extruded rather than loose pack material for the GoreSorber®, GoreSorber® uptake rate as a function of face velocity, temperature and RH effects during adsorption, and sampler shelf life determination.

The HMRC has concluded that both the GoreSorber® and the SKC sampler can collect quantitative levels of agent and be successfully analyzed for that agent. The SKC sampler has the advantage of more sorbent being present in the sampler that may allow longer sampling periods. The higher sampling rate of the GoreSorber® makes it advantageous for low levels of chemical agent that may not be collected at a quantifiable level by the SKC sampler. Figures 5.1 and 5.2 show the comparison of the IPCS candidate samplers in comparison with the response of other detectors that have been or are being considered for fielding by the military.

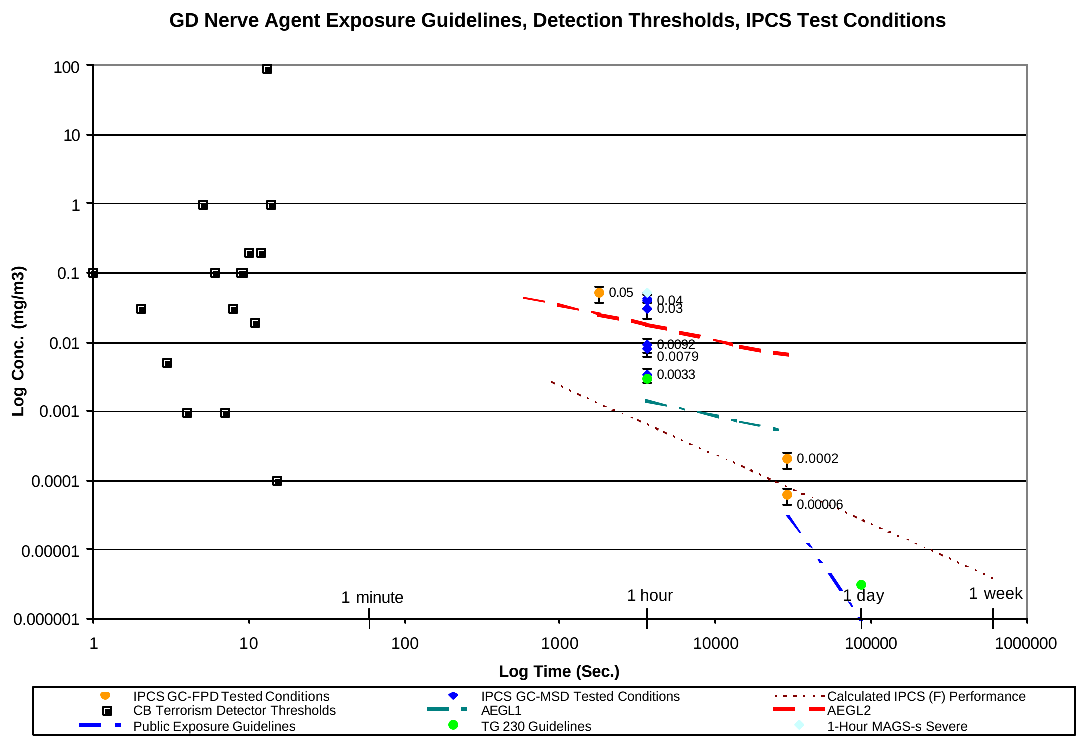


Figure 5.1 Comparison of the IPCS Detection Capability for GD to Currently Available Detectors and Exposure Guidelines

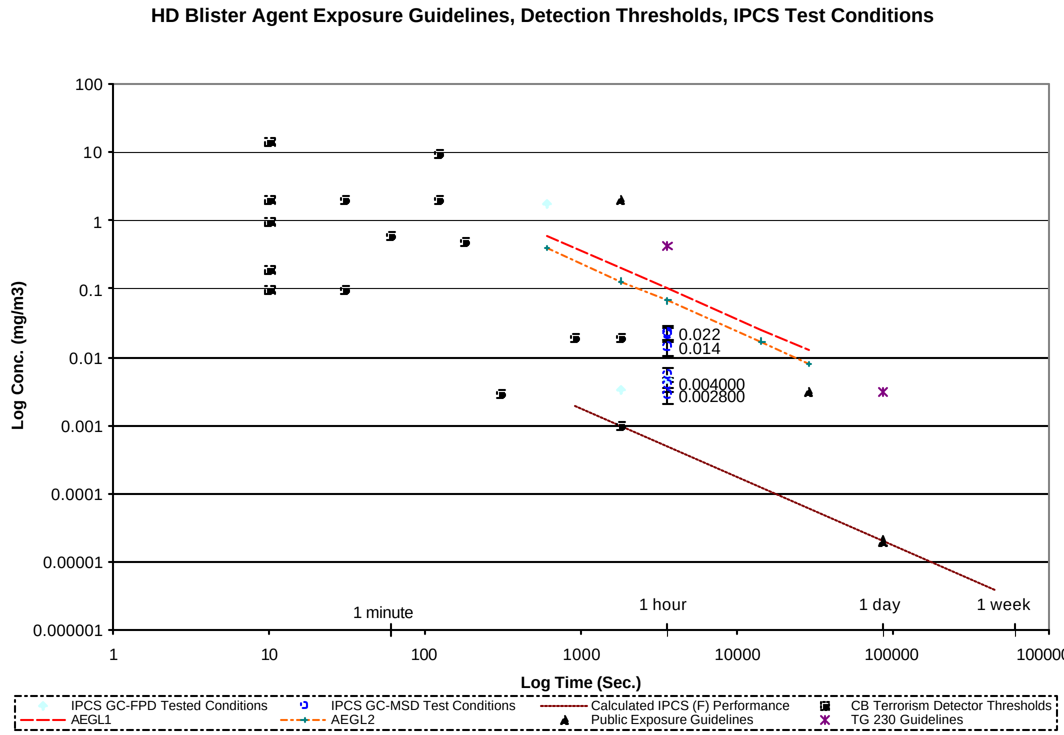


Figure 5.2 Comparison of the IPCS Detection Capability for GD to Currently Available Detectors and Exposure Guidelines

If this sampler were to be used by the military, there would be a need to analyze thousands to millions on a frequency approaching 2 weeks. The time for analysis coupled with the large number of samplers is likely to push analysis beyond the after-exposure storage time that is allowed for accurate estimation of exposure.

Additionally, the sampler capacity is not sufficient for long-term use in the battlefield. The estimates of capacity shown earlier indicate that the sampler would have to be replaced on a schedule approaching one day to prevent saturation of other chemicals present on the battlefield.

The following specific conclusions and recommendations were reached for each of the test plan areas.

5.1 System MDL

The system MDL was tested for GD and HD, the simulant MES, and TICs ethylbenzene, benzene, trimethyl benzene, tetrachloroethane, DDVP, acrolein, and phosgene. MDLs were successfully determined for all of the compounds except phosgene (no detection occurred). The MDL of acrolein and GD was found to be substantially above the expected quantity to be collected at the MAGs-S low 1-14 day level. Acrolein was dropped from further evaluation because of its poor peak shape and reproducibility in repeatable detection. The MDL of GD was right at the threshold of the MAGS-s low 1-14 day level collected for 1 day assuming 100% collection and desorption efficiency.

The HMRC recommends that alternate analysis of samples to measure low-level GD be instituted; for example, in the first phase of this program the HMRC showed successful collection and analysis near the GD AEGL (7x10^{-5} mg/m^3) using an FPD. For all the rest of the target compounds, splitting the desorbed sample from the ATD is desirable to put the sample into a quantitative level. An approach and possibly and instrument modification should be made so that a small split, in the range of 5-10 percent of total gas flow, is analyzed by the GC-MSD for positive identification of TICs and HD. All or part of the remaining flow should be directed to an FPD to better approach the GD MAGS-s 1-14 day low.

5.2 Extruded Sorbent

The results from the extruded sorbent show that it is slightly better than the powdered sorbent for sampling of benzene and ethylbenzene, but worse for the agents and TMB. From these data, it appears that the extruded Tenax TA may be better at capturing more volatile compounds at the expense of less volatile compounds.

On this basis, the extruded Tenax TA should not be considered as part of the IPCS unless benzene and ethylbenzene and similarly volatile compounds are the only targets.

5.3 Sampler Capacity

Tests conducted on GoreSorbers® and Tenax-loaded P-E tubes indicated that at 1 mg of total other chemical loading there is no agent recovery. With no other chemical loading the

percentage of agent recovered is approximately 100 percent for both systems. At between 100 and 300 ug of other chemical loading there appears to be a drop-off of agent recovery, indicating that capacity is being reached. The difference observed at this level in the data can be explained by the condition of the Tenax used; if the Tenax is loaded immediately after regeneration, then the capacity appears to be in the 300 ug range. On the as-received samplers the capacity appears to be in the 100 ug range. In order to maximize adsorption of agent in the presence of other chemicals having samplers immediately pre-cleaned before use appears to be advantageous.

5.4 Alternate Sorbent Testing

In this phase of testing the Supelco-recommended Carbopak X was tested as a potential substitute for Tenax. After exposure to both agents and all TICS, only benzene and ethylbenzene could be recovered (thermally desorbed). It is likely that all of the other compounds were adsorbed but were not released during thermal desorption. A similar effect was found for Carboxen during the initial sampler testing. On this basis, neither Carboxen nor Carbopak X are recommended sorbents. However, based on the limited capacity of Tenax for agent when other contaminants are present at acceptable levels from an industrial hygiene standpoint, one or both of two courses of action is recommended.

1. Conduct an evaluation of currently available sorbents and determine a better all-round sorbent. Candidates such as Tenax GR and other Carbopak materials should be initially considered.
2. Develop a multi-layer sorbent such as OSHA and NIOSH have developed for multiple organic material testing. This will require some sort of sorbent layering in the passive sampler to work similarly to the OSHA and NIOSH multi-sorbent tubes.

5.5 Face Velocity Testing of the GoreSorber®

The GoreSorber® was found to collect at a rate of about 31-35 mL/minute at face velocities ranging from 10 to 80 linear feet/minute. No significant trend in this rate was found for HD over the face velocity range. Further, data evaluation of other data collected during this experimental

program indicates that the rate of collection of GD is similar to that for HD (about 34 mL/minute).

This value is about 50 percent higher than the value found in the OSHA work that was conducted concurrently with this work (Personal communication, W Hendricks, OSHA-SLC and RK Smith, Battelle, April 15, 2002). OSHA has been asked to review the data and has so far found no discrepancy within Battelle's method of calculation. The approach that Battelle used was different from that used at OSHA-SLC; Battelle used a rotating carousel with badge faces pointed outward on the radius while OSHA used a tube with flow through it and badges hung at varying angles and face orientations in this tube. Both laboratories checked the concentration in the tube and the quantity of contaminated air in both laboratories was on the same order of magnitude. The geometry and test procedures do not appear to offer a reason for the difference in these results.

The HMRC recommends that these flow rate estimates be used for agent, and that the work done by OSHA to evaluate flow determination at different face velocities and conditions be applied to sampling rate when they become available if correlation factors can be determined for these compounds.

5.6 Environmental and Hold Time Testing

Testing conducted at low and high chemical concentrations indicated that there is a small amount of temperature dependence on adsorption for HD (increasing temperature appears to help adsorption, and there is not a noticeable effect of humidity on HD adsorption). For the SKC sampler and for the GoreSorber® at high concentrations, an increasing temperature appears to reduce the amount of DDVP that can be adsorbed.

There is a definite degradation of both agent and TIC collection for all conditions sampled when the samplers are held at ambient conditions in the laboratory. Based on the results of this testing and assuming a 25 percent loss is acceptable on a sorber, it is recommended that samplers be held no more than 14 days prior to analysis for agent, and no more than 28 days for analysis for TICs.

If hold times exceeding these recommendations are required, refrigeration of samples is recommended. This recommendation is consistent with the results from the initial study on agent adsorption that samples can be held under refrigeration with no degradation of sample for 7 days. It is recommended that testing be conducted to determine how much longer refrigerated samples can be held than unrefrigerated samples.

5.7 Interference Testing

Based on the testing done in this section, it appears that levels of other selected chemicals at industrial-hygiene-acceptable levels can cause Tenax to not absorb HD or GD. Based on this observation, Tenax is probably not the preferred sorbent for the IPCS. As discussed above, other sorbents and sorbent manufacturing approaches should be considered.

5.8 Manufacturing Support

Based on testing done at the HMRC, the background of SKC samplers appears to increase with increasing storage. This does not appear to be true of the GoreSorbers® because they are packaged in a jar; however, a preliminary test with D-8 toluene indicated that this material is adsorbed through the packaging of both samplers when they are stored for one week in an atmosphere near the vapor pressure of this material.

Because the adsorption of other chemicals appears to increase with age in the SKC samplers and because some leakage of the packaging was found for the GoreSorbers®, the HMRC recommends that the shelf life of the unexposed sorbers be reduced from two years. On a qualitative basis, it appears that six months for the SKC packaging and 1 year for the Gore packaging may be acceptable, but more definitive surveillance of samplers by lots is required to fully assess shelf life.

As discussed above, replacement of Tenax TA with another sorbent may help increase shelf life also by increasing capacity for agent when other chemicals are present in storage areas.

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_______, Laboratory Record Book 48876, May, 2001. Battelle Memorial Institute, Columbus, OH 43201

Appendix A
Test Plan

Appendix B
Test Data

Appendix C
Field Test Report Fort A.P. Hill

Appendix D
Field Test Report McKenna MOUT Facility

Appendix E
Field Test Report Amphibious Assault Ship Iwo Jima

Appendix A
Test Plan

Battelle
. . . Putting Technology To Work

Project Number CG920045-IPCSTEST

Internal Distribution

TH Danison
BM Campbell
BD Lerner
FL Moore
LA Hernon-Kenny

Date January 8, 2002

To Adam J. Becker, MARCORSYSCOM
through CA McKay, Stafford Office

From Russell K. Smith

Subject Interference Compounds for Testing

In order to complete this test program on schedule and budget, the Battelle Hazardous Materials Research Center (HMRC) proposes the following changes to the final test plan, Individual Passive Chemical Sampler Testing Continued, Performance Validation, dated March, 2001.

1) Reduction of scopes to include the following:
   a. Removal of the comparison of the Gore extruded and powdered materials and the comparison of different sorbents (paragraph 4.2). We have already collected some data and will report on that data.
   b. Removal of the cold test conditions for all testing (paragraph 4.5, cold condition tests (-10 C)).
   c. Reduction of hold time samples for the high temperature, high RH and low concentration challenges to four weeks from eight. In all cases, analysis will cease as of January 31, 2002, which means that on all samples for hold time we will have at least 4 weeks of data.

According to Paragraph 4.6 of the test plan which is titled Effects of Interferences the following interference list and loading is recommended. The challenge is selected so that one equivalent day of exposure occurs at the allowable industrial exposure limit. This limit should be an upper maximum seen in almost any environment, and is substantially higher than the levels found in testing in field and shipboard backgrounds.

Compound	OSHA PEL mg/m^3	Challenge Concentration, µg/L
1,1,2,2-tetrachloroethane	35 mg/m^3	280 µg/L
Limonene	None listed	4000 µg/L
Diesel fuel (contains compounds such as benzene, ethylbenzene, trimethyl benzene, dimethyl naphthalene, undecane, dodecane)	350 mg/m^3	2800 µg/L
Methyl isobutyl ketone	410 mg/m^3	3280 µg/L
Ammonia	35 mg/m^3	280 µg/L

Challenges will be done at ambient conditions (16-20 C 40-80% RH). This ambient condition is selected so that agent adsorption and interference can be evaluated at the most-frequent conditions tested to date, so that adsorption can be evaluated without accounting for the effects of temperature and humidity. The effects of temperature and humidity have not yet been analyzed on the sorption of agent (this analysis is on-going, but is not expected to be complete before challenge is necessary).

The interferences will be evaluated by the following procedure:

1. Blend together all interferents except ammonia in a mixture so that a single injection can be performed. All compounds are expected to be miscible. Ammonia will be injected as ammonium hydroxide (also called cloudy ammonia, 3-5% in water)
2. Establish agent and TIC challenge levels at the low level challenge concentrations per test plan. The assumed air flow is 10 Liters/minute, but may be adjusted in order to control the agent challenge.
3. Load the system with 7 each Gore and SKC samplers.
4. Begin vapor challenge.
5. At 5 minute intervals, inject 50 times the quantity of interferent shown in the table above. This assumes a 10L/minute flow, and puts into the chamber an equivalent of the interferent for 5 minutes of flow.
6. At the end of 1 hour, cease injection of interference compounds.
7. Continue operation of agent challenge for an additional 30 minutes.
8. Cease vapor challenge and remove samplers.
9. Provide all samplers to analytical for immediate analysis.

Data will be evaluated per the test plan data analysis section (Section 6.0).

Please approve or modify ASAP so that the final challenge can be accomplished on Thursday, January 10, 2002.

Approval:

Christopher A. McKay

____

CA McKay

____

Adam J. Becker

Test Plan

For

Contract No. SP0700-00-D3180/DO 0030/TAT 045

On

Individual Passive Chemical Sampler Testing Continued Performance Validation

To

US Marine Corps System Command (MARCORSYSCOM)

April 30, 2001

By

BD Lerner, CA McKay, LA Hernon-Kenny, and RK Smith

BATTELLE

505 King Avenue

Columbus, Ohio 43201-2693

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ABBREVIATIONS/ACRONYMS

ACGIH	*American Conference of Governmental Industrial Hygienists*
AEGLs	*Acute Exposure Guideline Levels*
ACTD	*Advanced Concept Technology Demonstration*
ATD-400	*Automated Thermal Desorber Model 400 -- a thermal desorption device that was previously manufactured by Perkin-Elmer Corporation*
ATSDR	*Agency for Toxic Substances and Disease Registry*
BTEX	*Common abbreviation for Benzene, Toluene, Ethyl benzene and Xylene*
CoC	*Chain of Custody*
COTS	*Commercial off-the-shelf*
CWA	*Chemical warfare agent*
DOD	*Department of Defense*
DOE	*Department of Energy*
ECBC	*Edgewood Chemical Biological Command*
EEGLs	*Emergency Exposure Guideline Levels*
EPA	*United States Environmental Protection Agency*
ERPGs	*Emergency Response Planning Guidelines*
FMP	*Force Medical Protection*
FPD	*Flame photometric detector*
GC	*Gas chromatograph*
GD	*Chemical agent soman*
HD	*Chemical agent mustard*
HMRC	*Battelle Hazardous Materials Research Center*
IDLH	*Immediately dangerous to life and health*
IDL	*Instrument Detection Limits*
IPCS	*Individual Passive Chemical Sampler*
IPT	*Integrated Product Team*
ITF	*International Task Force*
JCAD	*Joint Chemical Agent Detector*
LFPM	*Linear Feet per Minute*
LRB	*Laboratory Record Book*
MAGs-S	*Military Air Guidelines – Short Term*
MDL	*Method detection limit – minimum detection limit of the analytical instrument as configured and used.*
MSD	*Mass Selective detector (a mass spectrometer manufactured by Agilent as a detector specifically for GC)*
MARCORSYSCOM	*Marine Corps Systems Command*
MES	*Methyl Salicylate*
MRLs	*Minimum Risk Levels*
NAC	*National Advisory Council*
NIOSH	*National Institute of Occupational Safety and Health*
NRC	*National Research Council*

OSHA	***Occupational Safety and Health Administration***
OSHA-SLTC	***OSHA Salt Lake City, Utah Technical Center***
P-E	***Perkin-Elmer Corporation***
PI	***Principal Investigator***
PTFE	***Polytetrafluoroethylene***
QC	***Quality Control***
RH	***Relative humidity, percent (%)***
SKC	***SKC Corporation vapor sampler***
SOP	***Standard Operating Procedure***
SPEGLs	***Short-term Public Emergency Guideline Levels***
TEELs	***Temporary Emergency Exposure Levels***
TG	***Technical Guide***
TICs	***Toxic Industrial Chemicals***
TICN	***Test Item Control Number***
TLVs	***Threshold Limit Values***
TWA	***Time-weighted average (maximum allowed concentration for unprotected full-shift occupational exposure)***
UF	***Uncertainty Factor***
USACEHR	***US Army Center for Environmental Health Research***
USACHPPM	***US Army Center for Health Protection and Preventive Medicine***

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1.0 INTRODUCTION

The Force Medical Protection (FMP) Advanced Concept Technology Demonstration (ACTD) was implemented to address an urgent military need. The Joint Force Commander and force medical protection authorities require the capability to determine the environmental exposure of individual warfighters to low levels of chemical warfare agents (CWA) and toxic industrial chemicals (TICs). This ACTD proposes to satisfy this need using an Individual Passive Chemical Sampler (IPCS) system as part of an integrated Chemical/Biological defense and medical treatment system. This test plan will detail the lab characterization of this system as part of the ACTD assessment ofsystem performance. John Hopkins University Applied Physics laboratory personnel, as the independent ACTD assessors, may periodically require access during these tests to witness the performance testing as part of the required ACTD assessment.

1.1 Background

This testing results from work that has progressed throughout the program to this point. The work included the following items:

1.1.1 A market review was conducted to determine the availability of useful commercial off the shelf (COTS) equipment. Three samplers were selected as representative geometries for the IPCS. These were the Perkin-Elmer, Gore and SKC. The Perkin-Elmer ATD-400 thermal desorber and a GC-FPD were chosen as representative analysis system for chemical warfare agents (CWAs). The Gore and Perkin-Elmer designs allowed for direct placement of the sorbent material into the ATD sampling tube. The SKC design incorporated the sorbent into a small metal button that was encased inside a larger plastic housing. The SKC design required that the contents of the button be thermally desorbed using a TDSorb into a separate ATD sampling tube.

1.1.2 Validation testing was preformed on these sampler systems (IPCS plus analysis) with GD and HD at the 8-hour TWA and IDLH levels. This testing occurred at 30% RH and ambient lab conditions. The hold time of the samplers (1 day and 7 day) was tested with the holding done in refrigerated storage. There was also limited testing of the system with methyl salicylate (MES).

The Perkin-Elmer sampler did not perform adequately during these tests thus was removed form further testing. Also, the SKC 575 as manufactured posed some concerns because the capsules had to be desorbed one at a time. As a result, an interface has been designed by SKC to allow transfer of the sorbent into the P-E tube.

1.1.3 Technical review in the form of a government IPT (August 2000) composed of members from OSHA, NIOSH, USACHPPM, USACEHR, ECBC, and MARCORSYSCOM provided input into the final “baseline” IPCS system. This system is composed of the SKC or Gore sampler, an ATD-400 (or Turbomatrix®) thermal desorber from Perkin-Elmer, and an Aglient 6890/5973 GC/MSD. Target chemicals recommended, in addition to CWAs, were the BTEX compounds and other selected threat chemicals (ITF-25, TG-230A) that are potentially compatible with the IPCS system. In this instance, compatible includes both the ability of the sampler to capture the target analyte and for the target analyte to be successfully analyzed using the GC/MSD instrument. Chemical threat levels were revised to utilize TG230A, *Short-Term Chemical Exposure Guidelines for Deployed Military Personnel*, which provides the currently accepted exposure levels for deployed personnel. This Technical Guide (TG) provides air contaminant guidelines for 1 hour and 1 to 14 day exposures. These guidelines are referred to as Military Air Guidelines–Short Term (MAGs-S).

The MAGs-S values were derived from various sources including: American Conference of Governmental Industrial Hygienists (ACGIH), American Industrial Hygiene Association (AIHA), U.S. Environmental Protection Agency (EPA), Agency for Toxic Substances and Disease Registry (ATSDR), National Research Council (NRC) and others. These guidelines were developed based on exposure duration, frequency, and pathway (air/ water) on healthy fit adult male and females. Toxicity health effects (minimum, significant, and severe) are based on exposure to single substances (note values were NOT based on cancer risks). Simultaneous exposure to multiple substances or the same contaminant from multiple exposure pathways e.g. air, water, dermal may produce additive, antagonistic or synergistic deleterious effects not considered in establishing the MAGs-S. Note MAGs-S are not standards but are intended as a guidance tool for military health services personnel to inform commanders of potential adverse effects and to identify factors having potential to impact the mission.

Airborne concentrations of toxic chemicals necessary to produce short-term health effects are closer to emergency/occupational exposure guidelines than they are to ambient environmental air quality standards. Ambient air quality criteria are normally derived to protect the general population against chronic health effects from a lifetime of low-level exposure. Consequently, the MAGs-S were derived from emergency, military, and occupational exposure criteria, though in several cases where such criteria did not exist, the more protective (general population) environmental criteria were used. One-hour values are categorized as three levels of hazard severity. These levels represent a *minimal*, *significant*, and *severe* health effect levels. These categories parallel emergency guidelines established by various agencies as planning tools to identify risk minimization procedures from accidental chemical releases and provide a range to estimate the severity of the situation.

The 1 hour MAGs-S are a compilation of published values from Emergency Response Planning Guidelines[(ERPGs) AIHA]; Acute Exposure Guidelines Levels [(AEGLs) National Advisory Committee (NAC)/EPA]; and Temporary Emergency Exposure Limits [(TEELs) Department of Energy (DOE)] and where appropriate Emergency Exposure Guideline Levels [(EEGLs) NRC]; Short-term Public Emergency Guideline Levels [(SPEGLs) NRC], Ceiling Limit values (ACGIH), and Immediately Dangerous to Life and Health [(IDLH) National Institute of Safety and Occupational Health (NIOSH)] values.

The MAGs-S for 1- to 14-day inhalation exposures represent concentrations of chemicals in the air that are not expected to produce significant health effects in the deployed population for continuous exposures (e.g., 24 hours/day) up to 14 days in duration. These values are from published Continuous Exposure Guidance Levels [(CEGLs) NRC]; acute Minimum Risk Levels (MRLs) (ATSDR); Threshold Limit Values [(TLVs) ACGIH]; and Ceiling Values (ACGIH). The TLVs are Time-Weighted Average (TWA) criteria that are based on exposures for a working lifetime (approximately 30 years), 8 hours/day, 5 days/week, 50 weeks/year. The TWAs assume 2/3 of each day to be without exposure, during which time some clearance and detoxification may occur. Such breaks in exposure may not occur in typical deployment exposure scenarios, though ambient conditions may fluctuate. Therefore, based on the ACGIH documentation, the TLVs were grouped according to the type of effects expected [systemic toxicity, irritation, or both

(mixed)]. The TLVs for all systemic-acting substances (including mixed) were divided by an uncertainty factor (UF) of 10. This UF of 10 accounts primarily for the lack of breaks in exposure in continuously exposed, deployed military personnel that would normally allow limited clearance and detoxification to occur. These guidelines may be re-evaluated in respect to this modification as necessary. The TLVs for compounds acting only as irritants were not modified for this TG.

USACHPPM TG 230-A values for chemical agents were obtained from either reviewed military-specific literature or from military-sponsored NRC publications. The 1-hour MAGs for these agents are consistent with the minimal, significant, and severe levels described previously. Since the data from which these values were based were developed for a different purpose (offensive use), values consistent with a significant level of effect were not available. Therefore, only minimal and severe level values are present. The 1 to 14 day MAGs-S for chemical agents were based on Army/DOD worker 8-hour TWA values divided by the UF of 10. This data is shown below in Table 1.1 for both the chemicals that Battelle will be testing but also those that OSHA will use in their study.

Table 1.1 - Chemicals Of Interest With TG-230a Levels

	1 Hour MAGs-S Levels in mg/m^3				
	Name	**Minimal Effects Level**	**Significant Effects Level**	**Severe Effects Level**	**1 – 14 Day MAGs-S**
Battelle Chemical Agents and TICs	Acrolein	0.23	1.15	6.9	0.023
	n-Butyl isocyanate	0.04	0.2	4.1	N/D
	Phosgene	0.4	0.81	4	0.04
	Soman (GD)	0.003	N/A	0.05	0.000003
	Sulfur Mustard (HD)	0.42	N/D	1.7	0.003
OSHA TICS	Benzene	160	479	3195	0.16
	DDVP	N/A	N/A	N/A	N/A
	Ethyl Benzene	542	542	3474	43
	(R)-+-Limonene	N/A	N/A	N/A	N/A
	Tetrachloroethylene	N/A	N/A	N/A	N/A

Trimethylbenzene	N/A	N/A	N/A	N/A
Undecane	N/A	N/A	N/A	N/A

1.1.4 A field trial of the Gore and SKC samplers was conducted during live-fire exercises in November 2000 at Fort AP Hill, Virginia. This trial was to determine the effects of exposure to battlefield conditions on the sampler's ability to recover material and the subsequent analytical accuracy. The ability to recover material from field exposed samplers was tested by exposing samplers to a common HD surrogate, methyl salicylate (MES), before deployment. These pre-deployment exposed samplers were to be analyzed after their return. In addition, another series of samplers were to be exposed to MES after their deployment as a test of how well samplers would uptake material after field exposure. Finally, a number of samplers were used to examine what materials the samplers would collect from field exposure. In reality, a number of factors diminished the value of these tests. The most significant of these was that the bulk of the samplers were lost during the course of the maneuvers. This has led to a redesign of the holder the soldiers wear. In addition, although no definite conclusions could be drawn from the low sampler recovery, the results suggested that there might indeed be effects on the sampler's ability to collect target analytes once the sampler is exposed to the atmosphere

1.2 Objective

The purpose of this portion of the testing is to begin to characterize the performance of the IPCS system for various parameters including temperature, humidity, hold time, and interferents. Initially, these parameters will be tested for both CWA and a small group of selected TICs based on their known compatibility with the GC/MSD instrument. This testing will be done in concert with testing at the Occupational Safety and Health Administration's Salt Lake City Technical Center (OSHA SLTC). OSHA SLTC testing will focus on a different group of selected TICs, shown in Table 1-1, with the goal of producing a detailed sampler characterization using their published methods. All testing is to meet the interrelated goals of a scientific measure of system performance and limitations, identification of sampler parameters that will meet operational requirements, and an ACTD assessment of system performance.

2.0 TEST STRATEGY

2.1 It is recognized that the sampler exposure guidelines are the MAGs-S levels. It should also be noted, however, that with the exception of Soman (GD), exposure of the samplers to all MAGs-S levels will load the samplers to a point much, much greater than the anticipated instrument upper quantification limits. As such, the MAGs-S levels will be considered the minimum standard for sampler analytical sensitivity. In other words, the minimum detection limit will have to be below what would be loaded on the badge if the badge was exposed to a MAGs-S level of the specified time period. Both the upper and lower sampler material loading levels will be determined the levels the analytical instrumentation can tolerate.

2.2 All testing will focus on parameters affecting “sampling system” performance, meaning that the performance from sampling through analysis will be considered. The overall goal of this testing will be to produce parameters that can be transferred directly to field operations. The testing will involve the Gore and SKC passive air samplers. Although of different design, both samplers use Tenax TA with a 20/35 mesh size as their absorption media. In addition, testing will evaluate design and methodology improvements made to the samplers and analytical methods. This may include recommendations as to the gas diffusion rate into the samplers so they may be field deployable for an operationally acceptable period (up to one week) without exceeding capacity.

2.3 Integration of the thermal desorption unit (ATD-400) with the gas chromatograph/detector (Agilent 6890/5973 GC/MSD). This combination will serve as part of the “baseline” IPCS system. The testing at OSHA SLTC will also utilize this combination except that they will substitute the newest model of Perkin-Elmer thermal desorber, the Turbomatrix®, in their tests. This item should result in a minimal difference in performance, if any, between the labs but will give assurance that both the newer equipment and the older equipment can be used for testing.

2.4 Determination of the minimum instrument detection limits (IDL) ofthe analysis system for IPCS. A dual approach will be used to characterize the IDL. First the IDL of the GC/MSD will be determined for each chemical using direct injection into the device and generation of a calibration curve. Next the “system” detection limit or method detection limit (MDL) will be determined by depositing known

quantities of the target chemicals onto ATD tubes packed with Tenax and then running through the desorption/analysis process. The MDL study will look at not only the CWAs and TICs on the Battelle list, but also the TICs listed for OSHA SLTC. This will give the program an idea of those chemicals compatibility with the system and will generate confidence in the similarity of results between laboratories. The remaining tasks will concentrate only on the Battelle target chemicals, although trimethylbenzene will continue as a basis for inter-laboratory comparisons.

2.5 Two smaller studies will also be completed. The first will be to provide more information on another sorbent. Supelco has a new sorbent, Carbopack X®, which is supposed to have a broader chemical affinity than Tenax TA while still being thermally desorbable. The Carbopack X® will be evaluated using ATD tubes filled with Carbopack X® against tubes filled with Tenax TA®. The second study will evaluate another configuration of Tenax TA® impregnated on a matrix packet of PTFE. This differs from Gore's current loose fill design in that the sorbent densities are different due to the matrix versus loose fill conditions. Also, the mesh size of the sorbent materials is different, with the loose fill packets containing 20/35 mesh and the extruded packets contain 100/200 mesh (smaller particle size). This material will be compared directly against Gore's traditional loose filled sorbent packets by measuring percent recovery against conventionally packed Tenax ATD sorbent tubes.

2.6 Determine maximum badge analyte capacity. This will indicate how much material the sorbent in the samplers can retain. In short, the badges will be injected with increasing amounts of analyte until there is no longer any change in recovery versus amount injected.

2.7 The Gore commercial off-the-shelf sampler system will be tested at five face velocities using a CWA challenge to assure that agent flux rates into the badge are relatively constant over the three face velocities. The data on the SKC design is available in an OSHA report *Determination of the Sampling Rate Variation for SKC 575 Series Passive Samplers.* This report will be used as a reference for SKC face velocity data and together with the Gore tests will determine a composite face velocity at which the Gore and SKC should be tested in this study.

2.8 Interference of other chemicals with sampler performance will be tested to determine the effect on sampler performance absorbing target compounds. This will be done by exposing the samplers to a

realistic amount of background chemical loading that could be expected during a 7-day use cycle. The initial background chemical selection will be selected from interferents listed in Appendix C of the JCAD specification. In addition, the off-gas from the labels used on the Gore samplers will be characterized. Then the samplers will be challenged with the target chemicals at three levels spanning the detection range of the analytical equipment to determine their performance under these conditions. All three levels will be used to determine trends in sampler performance caused by interferents.

2.9 Environmental testing and hold testing will be combined into a matrix of tests that look at the parameters of temperature, humidity, and hold time. The challenge conditions (temperature and humidity) will be chosen to approximate the "real world" conditions of (1) Saudi Arabia, (2) Guam, (3) the Balkans (Kosovo/Yugoslavia area). Runs will be done at the high end and low end of the range of analysis. These levels should reduce the amounts of tests needed, but still be able to determine trends in sampler performance due to temperature, humidity, and the effects on hold time performance. If possible, a mixture of these chemicals will be used at once to reduce the required number of experiments. Each of these sampler runs will also be put through hold testing by analyzing a statistically number of the samplers at 2 weeks, 4 weeks, 6 weeks, and 8 weeks after exposure.

3.0 TEST EQUIPMENT AND PROCEDURES

The major pieces of test equipment are:

- The chemical vapor generator
- The exposure chamber
- The analytical system (ATD-400 and GC/MSD)

The following paragraphs describe each of these test equipment pieces. Figure 3-1, below, shows the system layout.

3.1 Chemical Vapor Generator

The chemical vapor generator that will be used for the system consists of an air regulator followed by

multiple mass flow controllers. The mass flow controllers are used to control total air flow and allow various concentrations to be mixed. Injecting the target analytes into an air stream at a known rate generates the selected TIC and CWA vapors. More specifically, the target analytes (including interferences) will be loaded as pure materials into syringe pumps or else as saturated atmospheric samples in a gas-tight syringe. The syringe pump will inject the analytes into an ambient temperature air stream at a known rate. Evaporation and aerosol formation will fully place the analytes into the vapor state. Using the syringe pump is advantageous over other methods like permeation tubes in that it can be assumed that mass delivery will be constant over the entire time period, as opposed to mass delivery changing as the permeation reservoir is depleted. The use of syringe pumps will allow three factors to be independently varied to achieve the desired chamber concentration. These are the injection rate of the analytes, the flow volume of the air stream that the analytes are being injected into, and finally the flow rate of any additional dilution flow that will occur before the air enters the chamber. Flow mixing occurs in a separate chamber before entering the exposure chamber. The lines are wrapped with heat tape to prevent condensation of humidity or vapor between the generator and the exposure chamber. Currently, it is felt that there should be no chemical compatibility issues once the materials are in the vapor state.

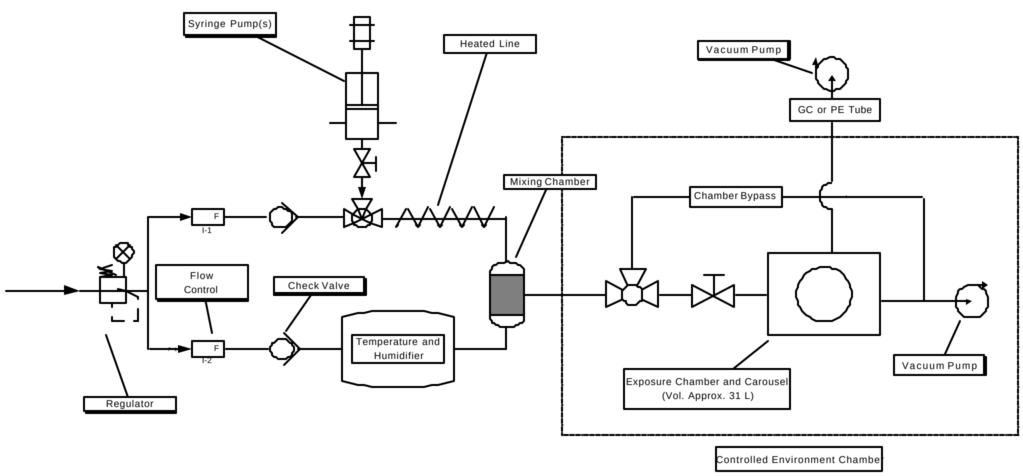


Figure 3-1 - IPCS Challenge System Schematic

3.2 Exposure Chamber

The exposure chamber must have two attributes; namely, the concentration of analytes must be as constant as possible during the exposure test and the samplers must be sampling passively. Loss of

analyte during the course of test could occur through wall absorption or chamber leakage. To prevent this, the chamber atmosphere will be constantly refreshed at a known rate. The exposure chamber being used has a volume of approximately 31 L. The CWAs- and TICs-containing gas will flow through the chamber at approximately 10 liters per minute. The chamber has a volume of about 31 L, so this flow rate will result in a complete change-over of the chamber atmosphere will occur at 3 minute intervals.

In order to achieve passive sampling, air flow from the atmosphere into the samplers must occur by diffusion. Thus, there must be no or a minimal pressure differential between the environment and the sampler sorbent bed. On the other hand, it is essential for these tests that there be no depletion of analyte in the environment immediately adjacent to the sampler. Thus it is necessary to constantly refresh the immediate environment the sampler is in. As indicated earlier, there will be some flow throughout the chamber. It will be necessary to average the environment the samplers are in however, so that all samplers will have similar exposure histories. This will be done by constantly moving the samplers during the course of the exposure period. The test chamber that will be used contains a carousel wheel from which the samplers will be hung. The carousel will be rotated at a speed to give a face velocity (tangential flow to the sampler face) of at least 20 LFPM[1]. The samplers will be hung in an orientation as close as possible to actual wear configuration while still conducting an effective test. The rotation and orientation will minimize the pressure differential across the sampler face so that flow from the bulk gas into the sampler occurs only by diffusion. The 10 L/minute chamber flow, coupled with turning the carousel by a motor, will provide fresh agent continuously to the surface of the sampler.

1 The face velocity of 20 LFPM was chosen based upon SKC recommendations and used during the validation testing. No face velocity data have yet been developed for the GoreSampler, but this study will develop some of this data

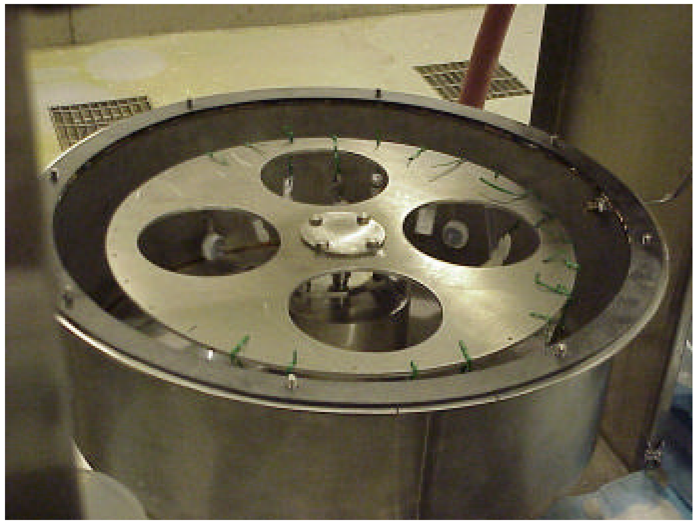


Figure 3-2 - Carousel showing GoreSorbers® and SKC 575 Samplers Mounted Into the Carousel

3.3 Sorbers

Two sorbers will be tested during operation. These sorbers are referred to as the SKC sampler and the GoreSorber®. A picture of these items is shown in Figure 3-3.

The SKC sampler contains a free powder adsorbent (20/35 mesh size Tenax TA®) that is transferred into

a 

Figure 3-3 - SKC Sampler, GoreSorber®, GoreSorber Pillow, and P-E Tube

P-E tube (Part number L4270123, also shown in Figure 3-3) after exposure. The GoreSorber pillow containing the same sorbent (Part number L4270123, also shown in Figure 3-3) is placed directly into the

P-E tube for analysis.

3.4 Analytical Instrumentation

The primary analytical instrumentation is an ATD-400 Thermal Desorber that is attached to an Agilent 6980 GC with an Agilent 5973 mass selective detector. This is shown in Figure 3.4.

Figure 3.4 – ATD (picture right) with Agilent GC/MSD (picture center and left, respectively)

The initial GC column used will be a Restek RTX-5, 30 m by 0.25 mm i.d., with a 0.25 micron thick film. The system is operated with a Windows operating system PC using the Agilent Chemstations® software.

4.0 EXPERIMENTAL APPROACH

In general, single agents will be used during exposure. This is required to alleviate difficulties in transporting the dosed ATD tubes from the West Jefferson facility to the King Ave. facility, and to simplify the analytical requirements. Multiple chemical loadings on single samplers will be used when feasible; this is particularly true for interferents which should not present analytical difficulties, but instead will affect the Tenax absorbent material in the IPCS samplers.

4.1 Instrument Detection Limit and Method Detection Limit

This experiment will determine the IDL and MDL for the chemicals listed in Table 1-1 (MES will be included as well because of its use as a field surrogate). A problem with using the conventional definitions of IDL and MDL is that they typically are based on the noise level of the measurement, and mass spectra are essentially noiseless. Thus, an artificially low IDL and MDL will be found. In addtion,

the establishment of the MDL requires not only signal response, but also mass spectral quality. Ideally the MDL is reached when the signal-to-noise for the least abundant ion is approximately 3 to 1 and the following criteria are still able to be met:

- All ions present above 10 % relative abundance in the standard mass spectrum should be present in the sample (in this case the sample is the standard that is just at 3:1 S/N or where there is no noise)
- The absolute abundance of the ions in the standard mass spectrum should agree within 20% in the sample mass spectrum
- Some ions such as the molecular ion are of special importance and should be evaluated even if they are below 10%
- Additionally the above criteria need to be met when there is no noise.

Initially the IDL will be determined by liquid injection. Various concentrations of the analytes in methylene chloride will be injected. It is anticipated that 0.125, 0.25, 0.5, 1, 5 and 10 ng will be injected. The IDL will be determined for each compound from these runs. If the analyte is not able to be identified and detected at 10 ng it will no longer be included in the test. With the exception of phosgene, all analytes found to be compatible with the GC/MSD analysis in the previous steps will be combined for each injection. Because of the unknown behavior of phosgene in these circumstances, it will be analyzed separately and last.

After completion of the IDL, the method detection limit (MDL) will be determined. As noted previously, the MDL relates to all components and processes used in the determination. Both the MSD and the ATD introduce some complexity into the MDL determination. The ATD desorption efficiency of the various components must be considered. In order to address these requirements, and to reduce the instrument time and material requirements, a stepped range of reagent concentrations will be injected directly into the instrument based on expected performance of the ATD.

For the second step of this study the Perkin/Elmer ATD 400® with an Agilent GC/MSD® will be used. To prepare the MDL samples standards and determine the MDL, the following will be performed:

4.1.1 The Tenax TA ATD tubes will be dosed by placing the analytes into the gaseous state and then passing the vapor into the sorbent. More specifically, the sample will be injected onto an inert matrix such as glass wool or cotton in another tube. This tube will be connected to the P-E tube that contains the Tenax TA. The contents of the first tube will be vaporized and transported into the P-E ATD tube by passing a 1 L/minute gas stream through the spiked tube and flowing the stream into the ATD tube. This is done because directly injecting the solvent onto the Tenax has been shown to be problematic, specifically because removing the solvent is difficult.

4.1.2 The test compounds will have different instrument responses and desorption efficiencies. Based on the IDL and analyst experience with many of these compounds a calibration curve that encompasses a range of approximately 0.5 to 10 ng will be run. Higher levels will be analyzed if needed. It is expected that the highest level analyzed for GD will be 8 to 10 ng, while for HD this may be increased to 50 ng because of the chromatographic characteristics of HD.

The MDL values generated will be compared to the respective MAGs-S minimal effect levels. This is to verify that the MDL are below what would be expected if the warfighter were exposed to the MAGS levels. In other words, the MDL is below what would be expected if the warfighter was exposed to a MAGs-S minimal effect level for one-hour. This represents the lowest possible material loading on the samplers. That is, although the exposure level is lower in the 1-14 day MAGs-S category, the longer term exposure results in a much higher amount of material being loaded on the sampler.

Phosgene will be evaluated separately and after all other samplers have been completed. Phosgene will be dissolved in a solvent like dichloromethane and directly injected. If any kind of recovery is present then the testing will continue in the same manner described above for the other analytes. This will include vaporizing the phosgene onto a sorbent pillow in the same manner as the other analytes.

4.2 Evaluation of Different Sorbent Materials and Configurations

As noted previously, Supelco has recently recommended a different sorbent material, Carbopack X®. This material will be evaluated as another possible IPCS sorbent material. As an initial comparison against Tenax TA®, the following will be performed:

4.2.1 Pack ATD tubes with Carbopack X and Tenax TA. These tubes will be pre-conditioned.

4.2.2 These tubes will be dosed with both CWAs and selected TICs at the MDL, 150% of the MDL and 200% of the MDL (analytes will be excluded that have not been successfully chromatographed, which is not anticipated for any analyte except phosgene and acrolein). Blanks will be included as well. Dosing will be done in duplicate under ambient conditions using the same method as before (see **4.1.1** above).

4.2.3 The tubes will be analyzed against standard spiked Tenax tubes prepared as described previously. Other significant findings will also be reported; this will include apparent background levels, although it should be noted that these tubes are prepared and treated in a different manner than the samplers.

A similar approach will be used to compare performance of the two W.L. Gore sorbent designs. A single Gore sorber packet will be used per ATD tube, which is consistent with what will be done during actual use.

4.3 Testing of Gore Flux Rates

This will be restricted to agents GD and HD only. A carousel arrangement will be used as described in **Section 3.2**. The angular velocities will be chosen such that a face velocity is achieved. Velocities will be from 0.1 m/sec to 3 m/sec in the range of 0.1, 0.2, 0.5, 1, 2, and 3. Itis thought that the diffusive flow of atmosphere into the Gore samplers is about 40 ml per minute. The concentration of agent will be chosen so that the samplers will be loaded with at least five times the MDL after 15 minutes of exposure as determined in **Section 4.1**. Overall, challenging will be conducted according to **Section 4.5** in this document.

After the samplers have been challenged, they will be analyzed as soon as possible and the chamber and sampler concentration data will be ratioed to determine the sampling rate as a function of the sampler face velocity. This will identify the variability of uptake with face velocity for the Gore samplers, which is

important information to know if results are to be correctly interpreted from the field. In addition, further tests will be performed using a face velocity above which the diffusion rate is constant with increasing face velocity.

4.4 Sampler Capacity

This test will determine at what point the badge will no longer retain GD or HD when the badge is loaded with various amounts of other components. GD and HD concentration will be kept constant and TICs will be used as the interferent. Agent concentration will be kept in the middle to upper range of the GC/MSD's maximum capacity. Challenge concentration of TICs will range from 100 ng to 5000 µg. All CWAs and TICs will be applied using liquid injection.

Capacity will be evaluated by choosing a peak from the chromatogram with a retention time that is well away from the agent peak. The recovery of agent will be evaluated as the amounts of TICs are increased. When the agent recovery falls to below 25% then the capacity of the tube has been reached. HD and GD capacity will be evaluated separately.

4.5 Sampler Challenge for Temperature, Humidity, and Hold Time Effects

Temperature and relative humidity are well documented as causing variability in sampler adsorption and desorption. The temperature conditions that are typical for regions where the badge may be deployed will be used. Table 4.5.1 shows the conditions for three such typical areas based on figures from the Air Force Climatology laboratory.

The conditions to be used are:

- Laboratory ambient conditions (usually 20 ^{o}C and 40-60% RH) – will be considered baseline conditions.
- A hot condition (44 ^{o}C dry bulb and 18% RH to simulate the hot/dry conditions of a location such as Saudi Arabia.
- Warm and moist conditions (30 ^{o}C and 80 percent RH) to emulate conditions on a warm, moist day. These conditions are extreme temperature conditions for a site such as Guam, and

the 80% humidity, while lower than the high humidity case for Guam, can be safely generated in the laboratory without rainout.

- A cold condition (-10 °C) to simulate conditions in the winter in an area such as Bosnia.

Table 4.5.1 – Typical World Atmospheric Conditions

Occurrence (Percent)	Dry Bulb Design Temperature (F)	Wet Bulb (F)	Humidity Ratio (gr/lb)
Dhahran, Saudi Arabia, 1973 to 1996			
0.4%	111	72	58
99.6%	45	41	32
Andersen Air Force Base, Guam, 1967 to 1996			
0.4%	88	79	139
99.6%	73	71	114
Belgrade, Yugoslavia, 1973 to 1996			
0.4%	91	71	76
99.6%	13	12	9

The sample hold time will be varied to determine the approximate time a sample can be held prior to analysis without losing the data. This will help determine the logistic burden on field units because they will require sufficient personnel and analytical resources to collect, transport, and analyze the samplers within this hold time. Each sample group will be composed of seven GoreSorbers® or seven SKC samplers. Groups will be compared using a Student-T to determine if the variability is outside of the 95 percent confidence interval.

Samplers will be stored at room temperature before challenge. The samplers will not be pre-conditioned. The samplers will be assigned an individual test item control number (TICN) prior to being placed into the test apparatus or used as a control sample. The number will be used to track the individual sampler throughout the test program. Each sampler will be tracked by the trial and analytical analysis time to permit outlier analysis. The test procedures will be conducted as follows:

4.5.1 Test concentrations will be based on MDL or MAGs-S values for each sampler, which ever is achievable by the analytical instrumentation. MAGs-S values will be the minimal effects for 1 hour exposure, the severe effects for one hour exposure and finally one day at the 1- 14 day MAGs-S exposure level. Chamber concentrations will be such that the samplers reach the target

values after at least 10 minutes of exposure (values may be modified on the basis of the diffusion test results). The target values will be the MDL, fives times the MDL and 10 times the MDL or MAGs-S at the significant or minimal levels, which ever is lower.

4.5.2 The test system will be equilibrated at or near the challenge concentration in the by-pass mode prior to loading the samplers into the test chamber. Because the samplers must be loaded with their diffusion systems active, they would be able to adsorb agent present before the test commences. Thus, bypass mode will provide a controlled exposure time for the samplers.

4.5.3 Concentrations in the test chamber will be generated using a syringe pump arrangement. The compounds will be grouped according to chemical solubility and compatibility.

4.5.4 Obtaining exact concentration of the TICS in the chamber will be done by controlling gas flows and then allowing time for stabilization of the concentration. For this reason, the goal concentration will be assumed to be achieved if the measured concentration is within ±25% of the goal. Once the challenge concentration is reached, the samplers will be placed on hangers and inserted into the test cell. The test chamber will be closed. The negative control samplers will also be opened at this time and exposed to the laboratory room air.

4.5.5 Once the samplers are loaded into the test chamber, the challenge air will be diverted to the test chamber and the carousel will be spun at the correct speed to achieve the required face velocity determined in **Section 4.3**.

4.5.6 The dosing system will be tested without samplers initially to see if the required concentrations are being reached. In addition, at the start of the run a Tenax tube will be drawn to further verify and document the actual concentration.

4.5.7 At the end of the sampling period the system will be placed in by-pass mode. The negative samplers will be closed and prepared for analysis. The samplers will be removed from the test chamber and resealed. The vapor challenge will also be turned off.

4.5.8 The GoreSorbers and SKC samplers will be transported into the analytical laboratory for storage and analysis preparation.

4.5.9 Three samplers of each type will be immediately removed for verification of dosing. Remaining samplers will be placed, sealed in their containers (Gore – glass vial; SKC – O-ring and lid) into a polyethylene bag with about 1 gram of charcoal in the bottom. The samplers will then be placed in a container at ambient in a laboratory and held until they are required for analysis. Temperature and relative humidity will be monitored using a Hobo® data logger. Hold times for the samples will be 2, 4, 6 and 8 weeks.

4.5.10 After each appropriate hold time the required number of samplers will be removed from storage. Then the pillow from the GoreSorber® or the powder from the SKC sampler will be placed into an ATD tube as soon as possible before analysis. The case will be decontaminated if necessary to remove chemical agent.

4.5.11 These samples will then be transported to the analysis laboratory containing the ATD-400 and GC/MSD. The samples will be opened, logged, and placed on the ATD-400 for analysis.

4.6 Effects of Interferences

The effects of interferents will be studied using the chemicals that are expected to be readily present in the battlefield and surrounding environment as well as in buildings. Examples of chemicals include:

- the active components in antibacterial hand soaps (chlorophenol)
- building cleaning compounds (trialkyl and triaryl ammonium chloride
- cooling tower water additives (organic amines)
- Explosives residues – trinitrotoluene (TNT) and cyclonite (Hexahydro-1,3,5-trinitro-1,3,5-triazine, or RDX) along with fillers and decomposition products (primarily phenols or similar compounds).

It should be noted that these interferents are more likely to effect the ability of the sampler to absorb

analytes of interest or else make it difficult to desorb analytes. As such, these interferents are more likely to produce false negative results than false positive results. It is highly unlikely that a false positive will occur due to the unique information produced by the combination of gas chromatography and mass spectrometry. In other words, a positive identification on the GC/MSD can generally only occur when the compound eludes at the right retention time and the associated mass spectrum is identifiable as a target analyte. It is highly unlikely that a substance in the environment will fulfill both of these requirements.

As an example of a potential interferent exposure that may produce a false negative, consider nitrous oxide and nitrogen dioxide. Because NO_x is a strong oxidizer, it could irreversibly damage the Tenax coatings. Indeed, testing with the early versions of ACAMS at Southern Research in the 1977 timeframe { need reference) showed that as little as 5 ppm NO_2 could severely degrade the sorbent that collects the agent. NO_2 is present in the exhaust from vehicles and other high temperature combustion processes, and therefore is ubiquitous. Other potential oxidants include ozone, chlorine, and peroxide. Several of these are on the JCAD list noted earlier. Chlorine could come from a number of sources, released either intentionally or accidentally. Ozone is found in highly polluted urban environments. Consideration will be given to using compounds with a more military origin like smokes and weapons exhaust gas, which are listed in the JCAD table, although these will have to be chemically identified.

Interferents can result in a false negative by two mechanisms; namely, either the interferent changes the characteristics of the sampler or else there is a simple chemical interference. Discerning which of these mechanisms is at work will be done by experiment. In the first experimental set, samplers will be exposed to the intereferent. These samplers, along with fresh samplers, will then be exposed to either the analyte or a surrogate. The differences in the recovery of the target analyte between the samplers that were exposed to an interferent and the unexposed samplers will indicate what effects, if any, the interferent has had on the sampler performance. In the other experiment, the samplers will be exposed to an atmosphere that contains both a target analyte and an interferent. Recovery of the target analyte will indicate what effects the interferent had, especially if the sampler showed good recovery when it was exposed to the interferent separate from the target analyte.

During test, the interferent concentrations used will depend on the normal state of the material when at room conditions. A liquid interferent will be tested at a concentration that is approximately 10% of the expected headspace vapor will be used. This is consistent with JCAD test procedures. When a gaseous material is used, a concentration equivalent to the 8-hour TWA will be used (1 ppm for NO_2; 0.5 ppm for chlorine gas). In either case, the total material loading for interferents will equate an 80-hour exposure at these levels, which is 50% of a full week. Environmental conditions for testing with all of the interferents will be at the upper and lower range of temperature, humidity and interferent concentration. Hold times will not be evaluated from samplers that have been exposed to interferents.

To evaluate the effects of any off-gas from Gore sampler label, a sample of clean labels (10 or less) will be placed in the TDSorb with the heat off. Gas will be flowed into a Tenax tube for at least 1 hour. This tube will be analyzed.

4.7 Analytical Analysis

A total of all samplers required are shown in Table 4.7.1. The temperature/RH/hold time studies are summarized in Table 4.7.2 and the interferent studies are shown in Table 4.7.3.

The gas chromatographs used in this study will be initially calibrated with three to five known concentration levels of TICs and CWAs. The GC used for thermal desorption is calibrated by preparing standards on Tenax tubes. Vapor solutions (usually 1-2 µL of liquid injected) will be flowed into the Tenax ATD tube.

Prior to the analysis of a batch of sample, a calibration curve will be run. The concentration of the three highest standards must be within 25% of theoretical for the initial calibration to be considered valid. If this is not the case, the suspected level(s) may be reanalyzed. If these are still unacceptable a new calibration curve will be run.

After every fifth sample, a quality control check standard will also be analyzed and should be within 25% of theoretical. If the QC standard is still outside of the 25% theoretical value then samples run before this

check standard back to the last acceptable check standard must be flagged and discussed in the report. Because the entire sample is desorbed into the GC there is no sample remaining for a second analysis.

Table 4.7.1 – Summary of Required Samplers				
Test Section	**Conditions**	**Experiment**	**Gore**	**SKC**
4.1 – IDL/MDL	NA	As required	None	None
4.2 – Different Sorbent Materials/Configurations	Ambient	Ambient	None	None
4.3 – Gore flux rates	Ambient	HD and GD together 7 samplers per velocity 6 Velocities 3 Blanks per Velocity	63	0
4.4 – Sampler Capacity	Ambient	HD and GD together 7 Levels of TIC concentration 7 Sorbent packets per level 3 Blanks per Level	70 packets (35 Samplers)	0 (Use equivalently packed ATD tubes)
4.5 – Challenge for Temp., Humidity and Hold Time	As Noted in Table 4.7.2	See Table 4.7.2	350	350
4.7 - Interferents	As Noted in Table 4.7.2	See Table 4.7.3	40	40
Total			**488**	**390**

Table 4.7.2 – Summary of Required Analyses for Hold Times					
Concentration	**Temp.**	**RH**	**Interference**	**Gore**	**SKC**
MAGs-S Significant	20° C	40 – 60%	---	7 Samplers per time period 3 Blanks/Time Period 5 Time periods 2 Agents 50 Total	50 (Same as Gore)
MAGs-S Minimal	20° C	40 – 60%	---	50	50
MAGs-S Significant	30° C	80%	---	50	50
MAGs-S Minimal	30° C	80%	---	50	50
MAGs-S Significant	44° C	18%	---	50	50
MAGs-S Minimal	44° C	18%	---	50	50
MAGs-S Significant	-10° C	---	---	50	50
MAGs-S Minimal	-10° C	---	---	50	50

Table 4.7.3 – Summary of Required Analysis for Interferents

MAGs-S Significant	44° C	80%	Yes	10	10
MAGs-S Significant	-10° C	Lowest Attainable	Yes	10	10
MAGs-S 1- 14 at 1 day	44° C	80%	Yes	10	10
MAGs-S 1- 14 at 1 day	-10° C	Lowest Attainable	Yes	10	10

4.8 Decontamination

Prior to transporting samples to the analytical laboratory, any external surfaces that were exposed to chemical agent will either be overpackaged or removed (GoreSorber) or wiped with a solvent-towel containing acetone or dichloromethane to mitigate the potential for contact hazards (SKC Sampler). The exterior of the sampler will be agent contaminated and must be cleaned so that an insignificant amount of agent remains on it before it can be analyzed. Cleaning is also important to avoid laboratory contamination.

4.9 Sample Destruction

Following testing, the holders for test samples will be decontaminated and disposed of in accordance with HMRC SOP. Holders of samples exposed to blister agent will be placed in a beaker of 5% bleach. Holders of samples exposed to nerve agent will be placed in a beaker of 10% caustic unless they have components made from incompatible materials (e.g. Aluminum). If they have incompatible materials, they will be decontaminated using 5% bleach as the alternate method.

5.0 QUALITY CONTROL

Total quality management provisions, including Chain-of-Custody (CoC) procedures and quality control (QC) tests, are built into the testing processes discussed above. These provisions are designed to do the following:

- Ensure proper test specimen identification, integrity, and control throughout the testing process.

- Validate the purity of the chemical agents used to challenge the test specimens.

- Confirm the significance and validity of the data generated; base on comparison with historical data on similar materials.

- Document the calibration procedures for the analytical instrumentation used throughout the testing process.

5.1 Chain-of-Custody (CoC)

The objective of the CoC forms is to ensure that the test specimens are traceable throughout all phases of testing. Each test specimen will be assigned a unique identifier code that matches it with the sample material and test to be performed. The identifier code will be attached to the bag containing the sampler specimen. The technician receiving the sampler will be responsible for comparing the identifier code with the test matrix.

5.2 Chemical Agent Quality

The chemical agents will be used under the terms and conditions of Bailment Agreement DAAM01-96-H-0009. Battelle's stock of agent will be analyzed periodically throughout the program to verify the purity of the agent used to generate the agent vapors. The purity of the liquid agent will be noted but will not significantly affect the vapor concentrations produced for this program. As noted earlier, the challenge vapor concentration will be determined for each trial and that analysis will determine the agent vapor challenge concentration rather than the liquid purity as is used for liquid challenges.

5.3 Equipment Calibration and System Characterization

The equipment used to support each test (i.e. gas chromatograph, ATD-400, GC/MSD, etc.) will be documented in the laboratory records. The operator will record the model and serial number (or Battelle I-number) of each test system component that measures, controls, and/or reports data. Each component will be calibrated in accordance with the manufacturer specification prior to test start. The test system will be characterized to ensure that all electro-mechanical devices and software are operating, both individually and as a system, within planned parameters prior to test start. Individual components will be disconnected and/or removed from the system and calibrated if required by 1) the manufacturer's specified frequency, 2) the frequency specified below or HMRC SOP and/or 3) the Principal Investigator (PI) questions the accuracy or precision of a component(s). After component calibration, the PI will decide if the entire system must be re-characterized.

5.4 Quality-Control (QC) Tests

QC is built into the test matrix for the chemical agent testing to document the performance of the test assembly and testing procedures. The following QC tests will be conducted to detect any variation in testing processes and procedures:

- **Baseline Controls**. Inter-sample variability will be evaluated for sorbent tubes used to determine agent concentration in the chamber prior to and during each trial. Samples will vary from the mean by less than 25 percent or the trial will be repeated and the chamber may be modified.

- **Negative Controls**. Three samples per sampler type per trial will be used as negative controls. These controls will determine if there is any laboratory specific contamination of the samples.

- **Positive Controls.** Positive Controls are currently not planned due to Cost and Schedule Constraints. The method used for calibrating the analytical instruments will be identical to a standard positive control.

5.5 Data Management and Data Quality Assurance

The objective of data management and QA procedures is to ensure the completeness and validity of the data acquired and processed throughout the program. All data generated during the program will be accounted for in a Battelle Laboratory Record Book (LRB) provided and controlled by Battelle's Records Management Office or, in the case of GC/MSD data, archived onto a CDROM. The LRB is used to document all aspects of a test (such as visual observations) that are not being automatically recorded by computerized control system, and to thoroughly document test trials and samples that were run within those trials.

Data QA will be achieved by implementing the following procedures:

- Daily verification of all data entered into the LRB (signature by Tester and Observer is required)

- Daily verification that all data generated during a test trial is accounted for and traceable to the LRB
- Daily verification that all automated test controls are functioning properly
- Daily and cumulative backup of data to either a network drive or CD-ROM.
- Should major variability occur at this point in sampler tests, (+50%) then a baseline development task for positive control development will be required.

6.0 RESULTS AND ANALYSIS

6.1 Measurements

The analytical results will be collected and compared to the agent challenge concentrations for reproducibility and to each other for intra-sampler variability.

Based on data provided by the manufacturers, the estimates of total TICS that will be present on each sorber are in the microgram range. The measured quantity will be affected by the actual rate of adsorption and the efficiency of desorption.

Data are anticipated to be presented as follows in Table 6-1.

Table 6-1. Results Presentation

TIC or Agent	TIC Challenge Concentration (mg/m^3)	Exposure Duration (minutes)	Hold Time Before Analysis (min or hrs)	GoreSorber Sampler Mean Concentration (mg/m^3)	SKC Sampler Mean Concentration (mg/m^3)

6.2 Statistical Analysis

Each sampler system will be characterized by the amount of detectable agent obtained from the sampler for each agent and challenge level. The mean and variability of the concentrations of detectable agent will be reported. Sampler systems will be characterized by the amount of detectable chemical obtained from the sampler 2, 4, 6, and 8 weeks after testing. The mean and variability of the concentrations of detectable agent will be reported. A two-sample t-test (a measure of statistical comparability) will be used to compare the amount of detectable agent at each time period after challenge to determine

variability.

6.3 Report

A final technical report will be submitted in draft. Government comments will be incorporated into the report. The report will include:

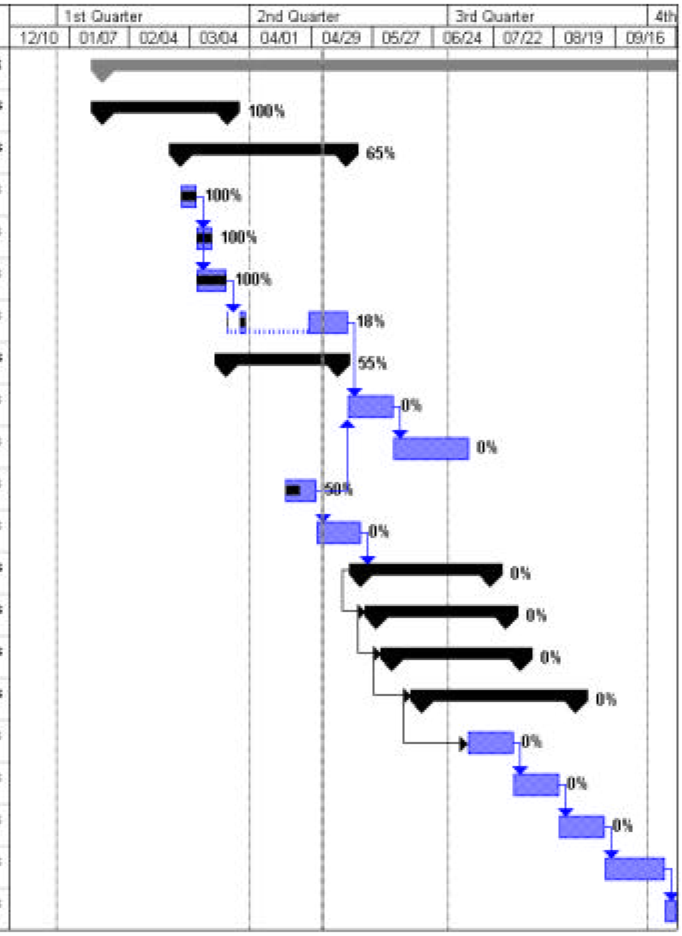
- A description of test conditions and tests conducted for each set of samplers.
- Analysis of the data and discussion of the variability between sampler sets, including discussion of major causes for variability.
- A thorough description of the setup and program for both equipment will be produced by Battelle to include all technical details of the setup included (but not limited to) model numbers of equipment used, procedures, custom made parts, settings, and lessons learned. This description will be a stand-alone document that could be used as a setup and operation guide for the system at either a commercial or deployed laboratory.

7.0 REFERENCES

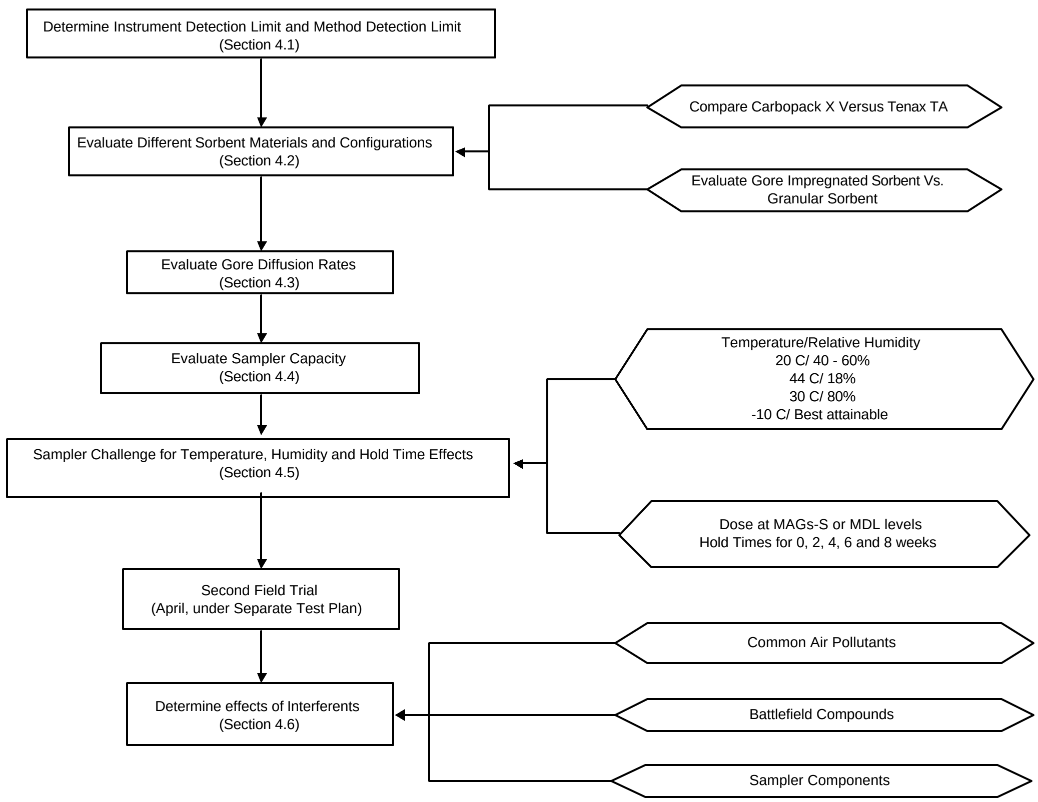
1) ER Kennedy, TJ Fischbach, R Song, PM Eller, SA Shulman; Guidelines for Air Sampling and Analytical Method Development and Evaluation, DHHS (NIOSH) Publication 95-117, pages 65 – 68 (1995).
2) Methods Development Team, Industrial Hygiene Chemistry Division, Evaluation Guidelines For Air Sampling Methods Utilizing Chromatographic Analysis, OSHA Salt Lake Technical Center, from the internet at www.osha.gov.
3) Warren Hendricks, Determination of the Sampling Rate Variation for SKC 575 Series Passive Samplers, April, 1998, http://www.osha-slc.gov/dts/sltc/methods/studies/skc575/skc575.html

APPENDIX A - PROGRAM SCHEDULE

ID	Task Name	Duration
0	**TIC Plan**	**191 days**
1	**1 Instrument Set-up**	**43 days**
7	**2 Prepare Challenge Equipmer**	**54.49 days**
8	2.1 Purchase Clean Exposur	5 days
9	2.2 Purchase Syringe Pumps	5 days
10	2.3 Assemble Equip for Non-,	10 days
11	2.4 Assemble Parts for Agen	15 days
12	**3 Field Test Support**	**38 days**
23	4 Carbopak Comparison	15 days
24	5 Extruded/Powder Core Compari	25 days
25	6 Badge Capacity	10 days
26	7 Face Velocity	15 days
27	**8 Middle Temp, Middle RH Exp**	**44 days**
33	**9 High Temp, High RH Exposur**	**44 days**
39	**10 High Temp, Middle RH Expo**	**44 days**
45	**11 Low Temp, Low RH Exposur**	**51.5 days**
52	12 Interference 1	15 days
53	13 Interference 2	15 days
54	14 Draft Report	15 days
55	15 Receive Comments	20 days
56	16 Final Report	5 days



APPENDIX B – FLOW CHART OF TEST PLAN


Determine Instrument Detection Limit and Method Detection Limit
(Section 4.1)
Evaluate Different Sorbent Materials and Configurations
(Section 4.2)
Compare Carbopack X Versus Tenax TA
Evaluate Gore Impregnated Sorbent Vs.
Granular Sorbent
Evaluate Gore Diffusion Rates
(Section 4.3)
Evaluate Sampler Capacity
(Section 4.4)
Temperature/Relative Humidity
20 C/ 40 - 60%
44 C/ 18%
30 C/ 80%
-10 C/ Best attainable
Sampler Challenge for Temperature, Humidity and Hold Time Effects
(Section 4.5)
Dose at MAGs-S or MDL levels
Hold Times for 0, 2, 4, 6 and 8 weeks
Second Field Trial
(April, under Separate Test Plan)
Common Air Pollutants
Determine effects of Interferents
(Section 4.6)
Battlefield Compounds
Sampler Components

Appendix B
Test Data

HI CON ROOM TEMP DAY 0		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS0001.D	STD 1 G/15 H/500 3-24-18	0.00	11.05	490.93	0.00
IPCS0002.D	STD 2 G/30 H/1000 3-24-18	0.00	33.29	1327.24	0.00
IPCS0003.D	STD 3 G/60 H/2000 3-24-17	0.00	57.35	1946.98	0.00
IPCS0004.D	STD 4 G/120 H/4000 3-24-17	0.00	121.00	3945.83	0.00
IPCS0005.D	BLANK	0.00	0.00	0.00	0.00
IPCS0006.D	GORE BLANK #1 DAY 0	0.00	0.00	0.00	0.00
IPCS0007.D	GORE BLANK #2 DAY 0	0.00	0.00	0.00	0.00
IPCS0008.D	GORE BLANK #3 DAY 0	0.00	0.00	0.00	0.00
IPCS0009.D	GORE G58-6 DAY 0	331.20	53.87	2182.33	894.40
IPCS0010.D	GORE G58-7 DAY 0	387.04	60.02	2354.47	955.49
IPCS0012.D	GORE G58-8 DAY 0	395.87	64.11	2374.59	957.40
IPCS0013.D	GORE G58-9 DAY 0	349.23	59.81	2154.13	888.77
IPCS0014.D	GORE G58-10 DAY 0	425.76	72.66	2633.69	1210.08
IPCS0015.D	GORE G58-11 DAY 0	423.57	70.45	2749.04	1255.07
IPCS0016.D	GORE G58-12 DAY 0	384.80	60.13	2531.79	1121.67
	AVG	385.35	63.01	2425.72	1040.41
	STD	32.6	6.1	206.9	141.4
	% RSD	8.5	9.7	8.5	13.6
IPCS0011.D	STD 1	0.00	12.86	597.83	0.00
IPCS0017.D	STD 2	0.00	25.88	1222.73	0.00
IPCS0018.D	SKC BLANK #1 DAY 0	24.17	0.00	0.00	0.00
IPCS0019.D	SKC BLANK #2 DAY 0	25.15	0.00	0.00	0.00
IPCS0020.D	SKC BLANK #3 DAY 0	26.53	0.00	0.00	0.00
IPCS0021.D	SKC SAMPLE #1 DAY 0	448.04	116.72	2478.81	960.62
IPCS0022.D	SKC SAMPLE #2 DAY 0	481.50	119.30	2649.56	1029.15
IPCS0024.D	SKC SAMPLE #3 DAY 0	496.65	124.20	2800.34	1102.68
IPCS0025.D	SKC SAMPLE #4 DAY 0	502.92	130.31	2689.77	1066.51
IPCS0026.D	SKC SAMPLE #5 DAY 0	493.60	126.82	2714.60	1098.24
IPCS0027.D	SKC SAMPLE #6 DAY 0	518.29	127.54	2831.31	1104.70
IPCS0028.D	SKC SAMPLE #7 DAY 0	504.07	127.95	2796.56	1121.63
	AVG	492.15	124.69	2708.71	1069.08
	STD	20.8	4.6	112.1	52.6
	% RSD	4.2	3.7	4.1	4.9
IPCS0023.D	STD 3	0.00	69.99	2270.39	0.00
IPCS0029.D	STD 4	0.00	135.72	3939.36	0.00

HI CON 30C DAY 0		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS0030.D	STD 1 G/15 H/500 3-24-18	0.00	10.03	461.61	0.00
IPCS0031.D	STD 2 G/30 H/1000 3-24-18	2.33	21.37	935.56	0.00
IPCS0032.D	STD 3 G/60 H/2000 3-24-17	0.00	55.75	2009.46	0.00
IPCS0033.D	STD 4 G/120 H/4000 3-24-17	0.00	115.71	3652.19	0.00
IPCS0034.D	TICS	526.39	0.00	0.00	899.00
IPCS0035.D	BLANK	0.00	0.00	0.00	0.00
IPCS0036.D	G64-18 BLANK DAY 0	4.81	0.00	0.00	0.00
IPCS0037.D	G64-19 BLANK DAY 0	4.26	0.00	0.00	0.00
IPCS0038.D	G64-20 BLANK DAY 0	62.54	0.00	0.00	0.00
IPCS0039.D	GORE G63-6 H30 D0	272.42	38.48	1181.79	192.74
IPCS0040.D	GORE G63-7 H30 D0	335.32	41.70	1508.08	264.40
IPCS0042.D	GORE G63-8 H30 D0	314.25	44.19	1403.51	232.14
IPCS0043.D	GORE G63-9 H30 D0	378.99	48.64	1730.15	294.87
IPCS0044.D	GORE G63-10 H30 D0	299.77	41.17	1353.58	221.70
IPCS0045.D	GORE G63-11 H30 D0	No Cal	**52.90**	**2208.81**	No Cal
IPCS0046.D	GORE G63-12 H30 D0	No Cal	**48.68**	**1655.61**	No Cal
	AVG	320.15	45.11	1577.36	241.17
	STD	40.06	5.13	334.11	39.46
	%RSD	12.5	11.4	21.2	16.4
IPCS0041.D	STD 1	0.00	14.38	571.99	0.00
IPCS0047.D	STD 2	0.00	26.39	1058.16	0.00
IPCS0048.D	S65-26 BLANK DAY 0	47.33	0.00	0.00	0.00
IPCS0049.D	S65-27 BLANK DAY 0	21.28	0.00	0.00	0.00
IPCS0050.D	S65-28 BLANK DAY 0	51.18	0.00	0.00	0.00
IPCS0051.D	S65-2 H30 D0	384.96	84.39	1523.36	240.94
IPCS0052.D	S65-3 H30 D0	428.94	90.39	1699.35	273.54
IPCS0054.D	S65-4 H30 D0	400.88	74.07	1457.03	231.57
IPCS0055.D	S65-5 H30 D0	345.36	59.27	1408.63	226.92
IPCS0056.D	S65-6 H30 D0	371.70	83.34	1418.81	223.51
IPCS0057.D	S65-7 H30 D0	369.32	70.98	1482.42	236.41
IPCS0058.D	S65-8 H30 D0	393.32	101.99	1607.18	258.02
	AVG	384.93	80.63	1513.83	241.56
	STD	26.60	13.94	106.09	18.08
	%RSD	6.9	17.3	7.0	7.5
IPCS0053.D	STD 3	0.00	75.85	2194.26	0.00
IPCS0059.D	STD 4	0.00	154.42	4096.43	0.00
IPCS0060.D	LITF B03070 5.5 MIN	678.45	92.84	2767.38	679.61
IPCS0061.D	LITF B00995	601.79	80.19	2416.52	497.17
IPCS0062.D	LITF A61677	589.66	77.50	2620.67	484.56
IPCS0063.D	STD 1	0.00	8.99	371	0.00
IPCS0064.D	STD 2	0.00	18.45	789.55	0.00
IPCS0066.D	GORE G63-11 H30 D0 RERUN	339.89	32.92	1497.42	266.6
IPCS0067.D	GORE G63-12 H30 D0 RERUN	No Cal	**15.96**	**1801.61**	No Cal
IPCS0068.D	STD 3	0.00	50.54	1616.53	0.00
IPCS0069.D	STD 4	0.00	130.7	3288.25	0.00

No Cal= external standard used to provide estimate of concentratiion

High Day 0 44 C Data File Name	Sample Name	TMB ng	GD ng	HD m/z 160 ng	DDVP ng
IPCS751.D	STD 1 GD-15, HD-500	0.00	16.41	628.62	0.00
IPCS752.D	STD 2 GD-30, HD-1000	0.39	26.06	1102.54	0.00
IPCS753.D	STD 3 GD-60, HD-2000	0.76	60.36	2403.73	0.00
IPCS754.D	STD 4 GD-120, HD-4000	1.84	101.09	3756.42	0.00
IPCS755.D	TICS	513.74	0.00	10.78	1027.48
IPCS756.D	EMPTY TUBE #1	0.00	0.00	0.00	0.00
IPCS757.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS758.D	GORE BLANK #1 H44D45	1.64	0.00	4.32	0.00
IPCS759.D	GORE BLANK #2 H44D45	1.81	0.00	3.01	0.00
IPCS760.D	GORE BLANK #3 H44D45	1.72	0.00	3.00	0.00
IPCS761.D	G69-2 H44D45	258.51	13.45	3670.33	636.92
IPCS762.D	G69-3 H44D45	189.41	11.73	3170.36	470.59
IPCS764.D	G69-4 H44D45	260.59	17.03	3903.80	700.89
IPCS765.D	G69-5 H44D45	210.03	15.24	3269.31	546.54
IPCS766.D	G69-6 H44D45	223.58	14.57	3301.36	495.94
IPCS767.D	G69-7 H44D45	239.29	19.33	3444.66	631.81
IPCS768.D	G69-8 H44D45	245.92	17.09	3687.87	634.67
	AVG	232.48	15.49	3492.53	588.19
	STD	26.25	2.55	268.13	84.87
	% RSD	11.3	16.4	7.7	14.4
IPCS770.D	SKC BLANK #1 H44D45	49.34	0.00	0.00	0.00
IPCS771.D	SKC BLANK #2 H44D45	51.94	0.00	0.00	0.00
IPCS772.D	SKC BLANK #3 H44D45	40.81	0.00	0.00	0.00
IPCS773.D	S71-2 H44D45	278.58	86.68	2750.25	587.89
IPCS774.D	S71-3 H44D45	265.01	79.95	2679.71	608.04
IPCS776.D	S71-4 H44D45	283.11	84.22	2475.82	565.41
IPCS777.D	S71-5 H44D45	291.18	76.19	2594.96	587.36
IPCS778.D	S71-6 H44D45	281.94	79.80	2374.10	548.31
IPCS779.D	S71-7 H44D45	281.94	69.04	2365.97	547.70
IPCS780.D	S71-8 H44D45	272.89	82.03	2443.08	566.72
	AVG	279.24	79.70	2526.27	573.06
	STD	8.32	5.78	150.97	22.37
	% RSD	3.0	7.3	6.0	3.9
IPCS763.D	STD 1 GD-15, HD-500	0.00	15.41	557.18	0.00
IPCS769.D	STD 2 GD-30, HD-1000	0.26	24.86	1376.21	0.00
IPCS775.D	STD 3 GD-60, HD-2000	2.80	92.39	2990.67	0.00
IPCS781.D	STD 4 GD-120, HD-4000	0.48	135.66	4396.89	0.00

I CON 44 C DAY 0		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
ipcs0076.D	STD 1 G/15 H/500 3-24-18	0.00	5.78	269.84	0.00
ipcs0077.D	STD 2 G/30 H/1000 3-24-18	0.00	23.29	964.72	0.00
ipcs0078.D	STD 3 G/60 H/2000 3-24-17	0.00	40.33	1453.02	0.00
ipcs0079.D	STD 4 G/120 H/4000 3-24-17	0.00	132.66	4311.08	0.00
IPCS0080.D	TICS	511.83	0.00	5.25	1023.66
ipcs0081.D	BLANK	0.00	0.00	0.00	0.00
ipcs0082.D	G69-18 BLANK H44 D0	5.08	0.00	0.00	0.00
ipcs0083.D	G69-19 BLANK H44 D0	4.46	0.00	0.00	0.00
ipcs0084.D	G69-20 BLANK H44 D0	7.15	0.00	0.00	0.00
ipcs0085.D	GORE G68-6 H44 D0	335.30	78.05	4010.88	1163.58
ipcs0086.D	GORE G68-7 H44 D0	287.87	62.26	3655.65	986.76
ipcs0088.D	GORE G68-8 H44 D0	322.17	71.21	4003.55	1161.43
ipcs0089.D	GORE G68-9 H44 D0	322.44	63.80	4118.72	1078.61
ipcs0090.D	GORE G68-10 H44 D0	288.43	68.25	3674.30	1001.48
ipcs0091.D	GORE G68-11 H44 D0	326.44	71.56	4225.81	1208.65
ipcs0092.D	GORE G68-12 H44 D0	330.30	70.63	4282.36	1256.21
	AVG	316.14	69.39	3995.90	1122.39
	STD	19.65	5.29	248.15	102.88
	%RSD	6.2	7.6	6.2	9.2
ipcs0094.D	S70-26 BLANK H44 D0	23.00	0.00	0.00	0.00
ipcs0095.D	S70-27 BLANK H44 D0	35.98	0.00	0.00	0.00
ipcs0096.D	S70-28 BLANK H44 D0	34.84	0.00	0.00	0.00
ipcs0097.D	S70-2 H44 D0	385.63	210.54	3963.51	1081.72
ipcs0098.D	S70-3 H44 D0	419.58	187.11	4475.46	1247.13
ipcs0100.D	S70-4 H44 D0	389.86	155.06	4215.00	1143.13
ipcs0101.D	S70-5 H44 D0	380.81	174.90	4164.52	1138.06
ipcs0102.D	S70-6 H44 D0	382.38	149.40	4221.59	1185.63
ipcs0103.D	S70-7 H44 D0	385.83	180.26	4238.28	1304.40
ipcs0104.D	S70-8 H44 D0	370.63	146.71	4167.60	1281.63
	AVG	387.82	172.00	4206.57	1197.39
	STD	15.25	23.19	150.54	82.67
	%RSD	3.9	13.5	3.6	6.9
ipcs0099.D	STD 1	2.22	10.57	541.05	0.00
ipcs0093.D	STD 2	0.00	18.16	1033.71	0.00
ipcs0087.D	STD 3	0.00	27.35	856.70	0.00
ipcs0105.D	STD 4	0.00	175.78	5307.70	0.00
IPCS0106.D	LITF #1 A80705	584.30	249.32	6317.37	2848.73
IPCS0107.D	LITF #2 B03070	490.91	225.08	6296.35	2485.05
IPCS0108.D	LITF #3 A99860	521.66	212.91	6465.40	2370.60

HI CON RT DAY 14		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS137.D	STD 1 GD-15, HD-500	0.00	6.07	327.46	0.00
IPCS138.D	STD 2 GD-30, HD-1000	0.00	23.92	993.27	0.00
IPCS139.D	STD 3 GD-60, HD-2000	0.00	47.47	2002.66	0.00
IPCS140.D	STD 4 GD-120, HD-4000	0.00	128.23	4021.92	0.00
IPCS141.D	TICS	478.44	0.00	1.54	956.87
IPCS142.D	BLANK	0.00	0.00	0.00	0.00
IPCS143.D	GORE BLANK #1 DAY 14	3.26	0.00	0.00	0.00
IPCS144.D	GORE BLANK #2 DAY 14	25.59	0.00	0.00	0.00
IPCS145.D	GORE BLANK #3 DAY 14	4.17	0.00	0.00	0.00
IPCS146.D	G58-14 DAY 14	351.54	18.16	2614.94	1003.56
IPCS147.D	G58-15 DAY 14	370.35	25.34	2853.50	1133.00
IPCS149.D	G58-16 DAY 14	391.59	28.26	3029.54	1183.01
IPCS150.D	G58-17 DAY 14	303.76	17.01	2491.56	956.85
IPCS151.D	G58-18 DAY 14	370.91	20.45	2696.75	1013.15
IPCS152.D	G58-19 DAY 14	324.99	24.10	2519.48	972.12
IPCS153.D	G58-20 DAY 14	302.32	33.98	2506.38	979.90
	AVG	345.07	23.90	2673.16	1034.51
	RSD	35.24	5.99	203.26	87.63
	%RSD	10.2	25.0	7.6	8.5
IPCS155.D	SKC BLANK #1 DAY 14	44.87	0.00	0.00	0.00
IPCS156.D	SKC BLANK #2 DAY 14	33.59	0.00	0.00	0.00
IPCS157.D	SKC BLANK #3 DAY 14	16.55	0.00	0.00	0.00
IPCS158.D	SKC SAMPLE #1 DAY 14	409.26	110.70	2697.81	1066.71
IPCS159.D	SKC SAMPLE #2 DAY 14	381.60	89.78	2651.99	1025.76
IPCS161.D	SKC SAMPLE #3 DAY 14	391.13	97.65	2705.79	1059.66
IPCS162.D	SKC SAMPLE #4 DAY 14	377.70	88.33	2695.56	1028.52
IPCS163.D	SKC SAMPLE #5 DAY 14	377.18	85.51	2638.76	1020.61
IPCS164.D	SKC SAMPLE #6 DAY 14	405.65	101.61	2770.64	1077.82
IPCS165.D	SKC SAMPLE #7 DAY 14	369.70	91.96	2497.97	947.15
	AVG	387.46	95.08	2665.50	1032.32
	RSD	15.11	8.83	85.23	43.68
	%RSD	3.9	9.3	3.2	4.2
IPCS148.D	STD 1 GD-15, HD-500	0.00	171.21	9124.99	0.00
IPCS154.D	STD 2 GD-30, HD-1000	0.00	28.71	1295.94	0.00
IPCS160.D	STD 3 GD-60, HD-2000	0.00	77.02	2523.71	0.00
IPCS166.D	STD 4 GD-120, HD-4000	0.00	134.75	4213.58	1.79

HI CONCENTRTION 30C DAY 14		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS177.D	STD 1 GD-15, HD-500	0.00	11.75	494.78	0.00
IPCS178.D	STD 2 GD-30, HD-1000	7.40	23.74	1024.94	0.00
IPCS179.D	STD 3 GD-60, HD-2000	0.00	46.51	2092.00	0.00
IPCS180.D	STD 4 GD-120, HD-4000	0.00	128.75	3948.42	0.00
IPCS181.D	TICS	485.44	0.00	0.00	970.87
IPCS182.D	BLANK	0.00	0.00	0.00	0.00
IPCS183.D	GORE BLANK DAY 14 #1	0.00	0.00	0.00	0.00
IPCS184.D	GORE BLANK DAY 14 #2	0.00	0.00	0.00	0.00
IPCS185.D	GORE BLANK DAY 14 #3	0.00	0.00	0.00	0.00
IPCS186.D	G63-14 DAY 14	286.45	19.83	1776.10	261.30
IPCS187.D	G63-15 DAY 14	321.52	21.62	1967.41	306.25
IPCS189.D	G63-16 DAY 14	312.21	23.63	1950.51	298.71
IPCS190.D	G63-17 DAY 14	297.86	19.68	1826.99	279.65
IPCS191.D	G63-18 DAY 14	273.00	19.25	1631.20	226.35
IPCS192.D	G63-19 DAY 14	288.79	16.82	1734.74	254.14
IPCS193.D	G63-20 DAY 14	324.34	25.77	2076.11	317.04
	AVG	300.60	20.94	1851.87	277.63
	STD	19.3	3.0	153.9	32.3
	%RSD	6.4	14.3	8.3	11.6
IPCS195.D	SKC BLANK DAY 14 #1	0.00	0.00	0.00	0.00
IPCS196.D	SKC BLANK DAY 14 #2	0.00	0.00	0.00	0.00
IPCS197.D	SKC BLANK DAY 14 #3	0.00	0.00	0.00	0.00
IPCS198.D	S65-10 DAY 14	331.93	59.08	1815.75	243.97
IPCS199.D	S65-11 DAY 14	311.97	54.69	1741.88	240.65
IPCS201.D	S65-12 DAY 14	385.40	69.99	2086.83	285.17
IPCS202.D	S65-13 DAY 14	313.23	58.20	1778.66	243.36
IPCS203.D	S65-14 DAY 14	305.17	60.38	1701.53	236.20
IPCS204.D	S65-15 DAY 14	333.41	71.37	1838.63	246.40
IPCS205.D	S65-16 DAY 14	346.33	78.82	1926.07	267.53
	AVG	332.49	64.65	1841.34	251.90
	STD	27.5	8.8	130.0	17.7
	%RSD	8.3	13.6	7.1	7.0

HI CONCENTRTION 44C DAY 14		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS267.D	STD 1 GD-15, HD-500	0.00	7.28	409.28	0.00
IPCS268.D	STD 2 GD-30, HD-1000	0.00	21.27	925.64	0.00
IPCS269.D	STD 3 GD-60, HD-2000	0.00	46.31	2106.12	0.00
IPCS270.D	STD 4 GD-120, HD-4000	0.00	129.99	3976.87	0.00
IPCS271.D	TICS	521.82	0.00	0.00	1043.65
IPCS272.D	BLANK	0.00	0.00	0.00	0.00
IPCS273.D	GORE BLANK #1 H44D14	1.74	0.00	0.00	0.00
IPCS274.D	GORE BLANK #2 H44D14	1.47	0.00	0.00	0.00
IPCS275.D	GORE BLANK #3 H44D14	1.35	0.00	0.00	0.00
IPCS276.D	G68-14 H44D14	281.47	5.19	2437.42	869.27
IPCS277.D	G68-15 H44D14	281.88	5.78	2552.16	951.77
IPCS279.D	G68-16 H44D14	317.53	7.13	2969.69	1196.52
IPCS280.D	G68-17 H44D14	331.77	5.82	2763.71	1096.02
IPCS281.D	G68-18 H44D14	297.23	4.27	2672.03	875.85
IPCS282.D	G68-19 H44D14	322.12	3.56	2854.50	1093.35
IPCS283.D	G68-20 H44D14	272.69	5.26	2712.79	988.70
	AVG	300.67	5.29	2708.90	1010.21
	STD	23.2	1.2	178.8	123.0
	%RSD	7.7	21.8	6.6	12.2
IPCS285.D	SKC BLANK #1 H44D14	28.10	0.00	0.00	0.00
IPCS286.D	SKC BLANK #2 H44D14	33.52	0.00	0.00	0.00
IPCS287.D	SKC BLANK #3 H44D14	44.87	0.00	0.00	0.00
IPCS288.D	S70-10 H44D14	346.77	64.31	2112.41	972.29
IPCS289.D	S70-11 H44D14	382.33	57.57	2178.51	999.48
IPCS291.D	S70-12 H44D14	397.17	61.16	2204.39	1054.68
IPCS292.D	S70-13 H44D14	383.95	68.03	2228.88	1053.63
IPCS293.D	S70-14 H44D14	314.84	58.74	1947.80	863.17
IPCS294.D	S70-15 H44D14	366.65	61.51	2181.56	1075.62
IPCS295.D	S70-16 H44D14	363.83	68.06	2259.15	1095.61
	AVG	365.08	62.77	2158.96	1016.35
	STD	27.5	4.2	103.8	79.9
	%RSD	7.5	6.7	4.8	7.9
IPCS278.D	STD 1 GD-15, HD-500	0.00	10.46	450.60	0.00
IPCS284.D	STD 2 GD-30, HD-1000	0.00	25.84	1078.71	0.00
IPCS290.D	STD 3 GD-60, HD-2000	0.00	73.54	2513.97	0.00
IPCS296.D	STD 4 GD-120, HD-4000	0.00	118.48	3722.51	0.00

HIGH CONC ROOM TEMP DAY 28		TMB	GD	HD m/z 160	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS391.D	STD 1 GD-15, HD-500	0.00	12.41	304.45	0.00
IPCS392.D	STD 2 GD-30, HD-1000	0.00	22.59	899.94	0.00
IPCS393.D	STD 3 GD-60, HD-2000	3.15	47.80	1026.91	9.88
IPCS394.D	STD 4 GD-120, HD-4000	0.78	125.91	4536.01	0.00
IPCS395.D	TICS	517.62	0.00	3.64	1035.25
IPCS396.D	BLANK	0.00	0.00	0.00	0.00
IPCS397.D	GORE BLANK #1 DAY 28	2.14	0.00	7.10	0.00
IPCS398.D	GORE BLANK #2 DAY 28	3.51	0.00	5.58	0.00
IPCS399.D	GORE BLANK #3 DAY 28	8.96	0.00	5.22	0.00
IPCS400.D	G58-22 DAY 28	426.46	31.00	3260.01	2798.39
IPCS401.D	G58-23 DAY 28	364.86	34.52	2955.51	2698.34
IPCS403.D	G58-24 DAY 28	380.99	27.68	3121.77	3148.62
IPCS404.D	G58-25 DAY 28	429.94	17.54	3352.32	3165.27
IPCS405.D	G58-26 DAY 28	481.67	13.28	3705.26	3542.44
IPCS406.D	G58-27 DAY 28	368.58	15.54	3054.27	2829.73
IPCS407.D	G58-28 DAY 28	401.12	14.68	3053.28	2812.34
	AVG	407.7	22.0	3214.6	2999.3
	STD	41.7	8.8	254.7	299.9
	% RSD	10.2	39.8	7.9	10.0
IPCS409.D	SKC BLANK #1 DAY 28	88.92	0.00	0.00	0.00
IPCS410.D	SKC BLANK #2 DAY 28	41.92	0.00	8.74	0.00
IPCS411.D	SKC BLANK #3 DAY 28	44.28	0.00	0.00	0.00
IPCS412.D	SKC SAMPLE #1 DAY 28	466.13	75.70	2794.74	2359.73
IPCS413.D	SKC SAMPLE #2 DAY 28	461.46	70.65	2700.09	2172.00
IPCS415.D	SKC SAMPLE #3 DAY 28	483.82	82.86	3069.55	2571.13
IPCS416.D	SKC SAMPLE #4 DAY 28	409.08	71.56	2706.52	2263.96
IPCS417.D	SKC SAMPLE #5 DAY 28	437.64	71.86	2806.18	2396.33
IPCS418.D	SKC SAMPLE #6 DAY 28	423.98	73.14	2799.19	2461.81
IPCS419.D	SKC SAMPLE #7 DAY 28	432.10	68.90	2795.20	2476.04
	AVG	444.9	73.5	2810.2	2385.9
	STD	26.4	4.6	123.0	135.2
	% RSD	5.9	6.3	4.4	5.7
IPCS402.D	STD 1 GD-15, HD-500	1.65	15.02	430.36	8.49
IPCS408.D	STD 2 GD-30, HD-1000	0.00	18.70	901.42	0.00
IPCS414.D	STD 3 GD-60, HD-2000	0.00	46.99	1884.97	0.00
IPCS420.D	STD 4 GD-120, HD-4000	0.00	76.45	2846.82	0.00

HIGH CONC 30C DAY 28		TMB	GD	HD m/z 160	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS425.D	STD 1 GD-15, HD-500	0.00	9.91	304.32	0.00
IPCS426.D	STD 2 GD-30, HD-1000	0.00	26.92	1259.33	0.00
IPCS427.D	STD 3 GD-60, HD-2000	0.00	48.29	1433.54	0.00
IPCS428.D	STD 4 GD-120, HD-4000	0.00	127.15	4242.86	0.00
IPCS429.D	TICS	509.11	41.44	988.31	1018.22
IPCS430.D	BLANK	0.00	0.00	0.00	0.00
IPCS431.D	GORE BLANK #1 DAY 28 H30	4.28	0.00	7.10	0.00
IPCS432.D	GORE BLANK #2 DAY 28 H30	3.57	0.00	6.93	0.00
IPCS433.D	GORE BLANK #3 DAY 28 H30	2.44	0.00	6.94	0.00
IPCS434.D	G63-22 DAY 28	301.35	16.62	2151.89	1026.09
IPCS435.D	G63-23 DAY 28	315.76	7.58	2300.56	1057.55
IPCS437.D	G63-24 DAY 28	332.25	17.10	2343.52	1167.09
IPCS438.D	G63-25 DAY 28	295.74	18.80	2095.20	1004.99
IPCS439.D	G63-26 DAY 28	303.26	13.53	2263.92	1109.40
IPCS440.D	G63-27 DAY 28	317.44	17.05	2204.32	1079.27
IPCS441.D	G63-28 DAY 28	313.09	7.50	2135.94	929.84
	AVG	311.3	14.0	2213.6	1053.5
	STD	12.3	4.7	92.1	76.5
	% RSD	3.9	33.5	4.2	7.3
IPCS443.D	SKC BLANK #1 DAY 28 H30	86.12	0.00	0.00	0.00
IPCS444.D	SKC BLANK #2 DAY 28 H30	66.49	0.00	0.00	0.00
IPCS445.D	SKC BLANK #3 DAY 28 H30	62.21	0.00	0.00	0.00
IPCS446.D	SKC 65-18 H30 DAY 28	325.35	28.45	1888.97	791.18
IPCS447.D	SKC 65-19 H30 DAY 28	371.37	32.78	1894.71	806.71
IPCS449.D	SKC S-65-20 H30 DAY 28	368.84	42.47	2006.66	839.26
IPCS450.D	SKC S-65-21 H30 DAY 28	346.27	43.72	1961.06	849.90
IPCS451.D	SKC S-65-22 H30 DAY 28	341.33	40.65	1977.46	878.93
IPCS452.D	SKC S-65-23 H30 DAY 28	338.92	38.85	1911.20	845.47
IPCS453.D	SKC S-65-24 H30 DAY 28	336.68	39.06	1890.59	819.57
	AVG	347.0	38.0	1933.0	833.0
	STD	17.0	5.5	48.1	29.5
	% RSD	4.9	14.4	2.5	3.5
IPCS436.D	STD 1 GD-15, HD-500	2.52	16.35	676.35	0.00
IPCS442.D	STD 2 GD-30, HD-1000	0.00	31.02	1487.95	0.00
IPCS448.D	STD 3 GD-60, HD-2000	0.00	61.13	2415.63	0.00
IPCS454.D	STD 4 GD-120, HD-4000	0.93	163.10	4343.28	0.00

Hi 44C Day28 RUN ON Day31		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS583.D	BLANK #1	0.00	0.00	0.00	0.00
IPCS584.D	BLANK #2	0.00	0.00	0.00	0.00
IPCS609.D	BLANK #3	0.55	0.00	0.00	0.00
IPCS610.D	BLANK #4	0.96	0.00	0.00	0.00
IPCS585.D	GORE BLANK #1 H44D28	3.40	0.00	3.45	0.00
IPCS586.D	GORE BLANK #2 H44D28	4.14	0.00	4.11	0.00
IPCS587.D	GORE BLANK #3 H44D28	4.93	0.00	4.28	0.00
IPCS588.D	G68-22 H44D28	274.89	12.31	2870.58	1666.22
IPCS589.D	G68-23 H44D28	273.18	14.85	2843.57	1602.83
IPCS591.D	G68-24 H44D28	308.60	24.24	2961.09	1843.51
IPCS592.D	G68-25 H44D28	258.50	9.76	2619.47	1388.59
IPCS593.D	G68-26 H44D28	335.49	25.51	3525.77	2235.59
IPCS594.D	G68-27 H44D28	293.10	19.05	3037.90	1730.44
IPCS595.D	G68-28 H44D28	280.98	17.78	2829.99	1510.59
	AVG	289.2	17.6	2955.5	1711.1
	STD	25.8	5.9	283.0	274.2
	% RSD	8.9	33.2	9.6	16.0
IPCS597.D	SKC BLANK #1 H44D28	11.33	0.00	0.00	0.00
IPCS598.D	SKC BLANK #2 H44D28	71.33	0.00	0.00	0.00
IPCS599.D	SKC BLANK #3 H44D28	43.97	0.00	0.00	0.00
IPCS600.D	S70-18 H44D28	372.91	74.43	2577.61	1714.50
IPCS601.D	S70-19 H44D28	320.94	73.13	2565.79	1652.17
IPCS603.D	S70-20 H44D28	374.13	69.24	2597.38	1706.85
IPCS604.D	S70-21 H44D28	212.81	77.08	2652.60	1839.99
IPCS605.D	S70-22 H44D28	328.67	82.33	2587.49	1771.69
IPCS606.D	S70-23 H44D28	59.68	71.48	2649.08	1828.46
IPCS607.D	S70-24 H44D28	355.94	65.68	2659.47	1827.88
	AVG	289.3	73.3	2612.8	1763.1
	STD	115.3	5.4	39.6	73.4
	% RSD	39.9	7.4	1.5	4.2
IPCS578.D	STD 1 GD-15, HD-500	0.24	24.65	676.40	0.00
IPCS590.D	STD 1 GD-15, HD-500	0.26	10.37	213.68	0.00
IPCS579.D	STD 2 GD-30, HD-1000	0.10	24.31	898.34	0.00
IPCS596.D	STD 2 GD-30, HD-1000	0.00	24.96	977.89	0.00
IPCS580.D	STD 3 GD-60, HD-2000	1.42	45.27	1245.67	0.00
IPCS602.D	STD 3 GD-60, HD-2000	0.29	66.69	2082.63	0.00
IPCS608.D	STD 3 GD-60, HD-2000	1.28	73.52	2034.90	0.00
IPCS581.D	STD 4 GD-120, HD-4000	0.42	116.06	3805.97	0.00
IPCS582.D	TICS	603.46	0.00	1.00	1206.93

ACTUALLY 31 DAYS NOT 28

High Day 42 RT Data File Name	Sample Name	TMB ng	GD ng	HD m/z 160 ng	DDVP ng
IPCS615.D	STD 1 GD-15, HD-500	1.03	12.49	333.46	0.00
IPCS616.D	STD 2 GD-30, HD-1000	1.76	76.14	2156.39	0.00
IPCS617.D	STD 3 GD-60, HD-2000	0.62	35.94	1251.31	0.00
IPCS618.D	STD 4 GD-120, HD-4000	0.53	92.09	3454.02	0.00
IPCS619.D	TICS	463.22	0.00	2.78	926.44
IPCS620.D	BLANK #1	0.00	0.00	0.00	0.00
IPCS621.D	BLANK #2	0.00	0.00	0.00	0.00
IPCS622.D	GORE BLANK #1 HRTD42	3.33	0.00	2.91	0.00
IPCS623.D	GORE BLANK #2 HRTD42	1.70	0.00	3.01	0.00
IPCS624.D	GORE BLANK #3 HRTD42	0.84	0.00	2.26	0.00
IPCS625.D	G59-2 HRTD42	356.20	10.10	2600.93	2706.83
IPCS626.D	G59-3 HRTD42	391.85	16.18	2606.69	2708.44
IPCS628.D	G59-4 HRTD42	229.21	10.66	2004.69	1613.11
IPCS629.D	G59-5 HRTD42	320.53	9.08	2351.79	2234.13
IPCS630.D	G59-6 HRTD42	306.02	25.12	2301.12	2352.77
IPCS631.D	G59-7 HRTD42	334.44	22.73	2498.90	2639.01
IPCS632.D	G59-8 HRTD42	368.91	14.77	2396.72	2369.60
	AVG	329.59	15.52	2394.41	2374.84
	STD	53.02	6.32	208.58	385.54
	% RSD	16.1	40.7	8.7	16.2
IPCS634.D	SKC BLANK #1 HRTD42	41.14	0.00	0.00	0.00
IPCS635.D	SKC BLANK #2 HRTD42	54.49	0.00	0.00	0.00
IPCS636.D	SKC BLANK #3 HRTD42	57.24	0.00	0.00	0.00
IPCS637.D	SKC SAMPLE #1 HRTD42	353.74	76.07	2153.79	2742.34
IPCS638.D	SKC SAMPLE #2 HRTD42	360.55	65.25	2246.99	2588.91
IPCS640.D	SKC SAMPLE #3 HRTD42	375.88	74.46	2223.43	2995.01
IPCS641.D	SKC SAMPLE #4 HRTD42	372.09	73.18	2127.73	2851.85
IPCS642.D	SKC SAMPLE #5 HRTD42	376.14	71.17	2193.14	2721.40
IPCS643.D	SKC SAMPLE #6 HRTD42	387.71	71.96	2277.29	3106.60
IPCS644.D	SKC SAMPLE #7 HRTD42	387.74	159.75	2335.64	3234.07
	AVG	373.41	84.55	2222.57	2891.45
	STD	12.76	33.34	71.84	230.45
	% RSD	3.4	39.4	3.2	8.0
IPCS627.D	STD 1 GD-15, HD-500	0.57	8.68	270.30	0.00
IPCS633.D	STD 2 GD-30, HD-1000	0.53	13.00	472.21	0.00
IPCS639.D	STD 3 GD-60, HD-2000	0.34	48.22	2104.32	0.00
IPCS645.D	STD 4 GD-120, HD-4000	0.17	124.37	4108.50	0.00

High Day 42 30 C Data File Name	Sample Name	TMB ng	GD ng	HD m/z 160 ng	DDVP ng
IPCS648.D	STD 1 GD-15, HD-500	0.17	10.04	370.35	0.00
IPCS649.D	STD 2 GD-30, HD-1000	0.00	24.34	929.43	0.00
IPCS650.D	STD 3 GD-60, HD-2000	1.24	49.38	2117.50	0.00
IPCS651.D	STD 4 GD-120, HD-4000	0.00	99.66	3975.10	0.00
IPCS652.D	TICS	502.82	0.00	0.00	1005.65
IPCS653.D	EMPTY TUBE #1	0.00	0.00	0.00	0.00
IPCS654.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS655.D	GORE BLANK #1 H30D42	1.67	0.00	0.00	0.00
IPCS656.D	GORE BLANK #2 H30D42	1.60	0.00	0.00	0.00
IPCS657.D	GORE BLANK #3 H30D42	0.00	0.00	0.00	0.00
IPCS658.D	G64-2 H30D42	246.37	22.98	1823.87	272.99
IPCS659.D	G64-3 H30D42	310.22	25.36	2141.35	341.41
IPCS661.D	G64-4 H30D42	234.01	10.03	1747.36	266.00
IPCS662.D	G64-5 H30D42	274.18	17.09	2181.74	371.73
IPCS663.D	G64-6 H30D42	297.24	18.82	2095.05	335.98
IPCS664.D	G64-7 H30D42	263.43	16.94	2074.09	344.63
IPCS665.D	G64-8 H30D42	263.89	14.42	1950.40	321.53
	AVG	269.91	17.95	2001.98	322.04
	STD	26.81	5.13	165.74	38.93
	% RSD	9.9	28.6	8.3	12.1
IPCS667.D	SKC BLANK #1 H30D42	73.39	0.00	0.00	0.00
IPCS668.D	SKC BLANK #2 H30D42	80.48	0.00	0.00	0.00
IPCS669.D	SKC BLANK #3 H30D42	29.97	0.00	0.00	0.00
IPCS670.D	S66-2 H30D42	319.37	48.52	1825.78	273.37
IPCS671.D	S66-3 H30D42	338.12	44.52	1946.63	299.67
IPCS673.D	S66-4 H30D42	299.37	44.80	1834.10	266.97
IPCS674.D	S66-5 H30D42	291.92	42.82	1807.47	271.93
IPCS675.D	S66-6 H30D42	299.49	50.44	1745.35	285.75
IPCS676.D	S66-7 H30D42	281.63	47.36	1736.22	274.01
IPCS677.D	S66-8 H30D42	308.63	44.89	1721.33	276.36
	AVG	305.50	46.19	1802.41	278.29
	STD	18.68	2.67	78.09	11.01
	% RSD	6.1	5.8	4.3	4.0
IPCS660.D	STD 1 GD-15, HD-500	0.00	12.49	452.96	0.00
IPCS666.D	STD 2 GD-30, HD-1000	0.00	24.13	1001.55	0.00
IPCS672.D	STD 3 GD-60, HD-2000	0.39	55.46	2361.21	0.00
IPCS678.D	STD 4 GD-120, HD-4000	0.17	63.99	2951.84	0.00

DAY 56 SAMPLES RUN ON DAY 65		TMB	GD	HD m/z 160	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS1066.D	STD 1 GD-15, HD-500	0.00	11.37	427.81	1.17
IPCS1067.D	STD 2 GD-30, HD-1000	0.31	25.22	1075.10	0.00
IPCS1068.D	STD 3 GD-60, HD-2000	0.50	54.18	1866.94	0.00
IPCS1069.D	STD 4 GD-120, HD-4000	0.89	124.56	4056.78	0.00
IPCS1070.D	TICS	508.09	2.15	8.40	1016.17
IPCS1071.D	EMPTY TUBE #1	0.00	0.00	0.00	0.00
IPCS1072.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS1073.D	GORE BLANK #1 HRTD65	3.38	0.00	3.83	0.00
IPCS1074.D	GORE BLANK #2 HRTD65	2.40	0.00	3.80	0.00
IPCS1075.D	GORE BLANK #3 HRTD65	3.42	0.00	3.65	0.00
IPCS1076.D	GORE SAMPLE #1 HRTD65	350.25	22.80	2509.32	997.11
IPCS1077.D	GORE SAMPLE #2 HRTD65	327.38	11.99	2460.70	971.05
IPCS1079.D	GORE SAMPLE #3 HRTD65	321.69	18.45	2206.29	820.17
IPCS1080.D	GORE SAMPLE #4 HRTD65	362.84	15.93	2592.72	1081.38
IPCS1081.D	GORE SAMPLE #5 HRTD65	292.03	9.89	2151.84	762.13
IPCS1082.D	GORE SAMPLE #6 HRTD65	305.74	14.97	2240.65	813.28
IPCS1083.D	GORE SAMPLE #7 HRTD65	324.81	15.58	2419.20	948.78
	AVG	326.39	15.66	2368.67	913.41
	STD	24.26	4.20	168.71	116.47
	% RSD	7.4	26.9	7.1	12.8
IPCS1085.D	SKC BLANK #1 HRTD65	36.24	0.00	0.00	0.00
IPCS1086.D	SKC BLANK #2 HRTD65	33.16	0.00	0.00	0.00
IPCS1087.D	SKC BLANK #3 HRTD65	21.41	0.00	0.00	0.00
IPCS1088.D	SKC SAMPLE #1 HRTD65	368.04	61.81	2185.83	821.04
IPCS1089.D	SKC SAMPLE #2 HRTD65	380.98	59.35	2197.19	859.23
IPCS1091.D	SKC SAMPLE #3 HRTD65	375.37	61.09	2169.54	847.43
IPCS1092.D	SKC SAMPLE #4 HRTD65	362.14	68.31	2142.46	867.79
IPCS1093.D	SKC SAMPLE #5 HRTD65	334.90	60.53	1998.56	756.14
IPCS1094.D	SKC SAMPLE #6 HRTD65	371.57	73.89	2189.04	859.86
IPCS1095.D	SKC SAMPLE #7 HRTD65	358.00	58.80	2174.76	833.11
	AVG	364.43	63.40	2151.05	834.94
	STD	15.14	5.59	69.54	38.41
	% RSD	4.2	8.8	3.2	4.6
IPCS1078.D	STD 1 GD-15, HD-500	0.70	10.44	456.81	0.62
IPCS1084.D	STD 2 GD-30, HD-1000	0.75	28.53	1279.68	1.03
IPCS1090.D	STD 3 GD-60, HD-2000	0.34	48.00	1933.25	0.00
IPCS1096.D	STD 4 GD-120, HD-4000	0.45	109.90	3233.69	0.00

DAY 56 SAMPLES RUN ON DAY 55		TMB	GD	HD m/z 160	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS876.D	STD 1 GD-15, HD-500	0.00	6.37	472.60	0.00
IPCS877.D	STD 2 GD-30, HD-1000	0.00	20.38	1333.23	0.00
IPCS878.D	STD 3 GD-60, HD-2000	0.00	46.22	2485.15	0.00
IPCS879.D	STD 4 GD-120, HD-4000	0.00	121.61	4293.24	0.00
IPCS880.D	TICS	477.41	0.83	0.00	954.82
IPCS881.D	EMPTY TUBE #1	0.00	0.00	0.00	0.00
IPCS882.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS883.D	GORE BLANK #1 H30D55	0.32	0.00	0.00	0.00
IPCS884.D	GORE BLANK #2 H30D55	0.42	0.00	0.00	0.00
IPCS885.D	GORE BLANK #3 H30D55	0.45	0.00	0.00	0.00
IPCS886.D	G44-10 H30D55	246.98	10.51	2039.51	356.95
IPCS887.D	G44-11 H30D55	265.97	10.96	1966.45	326.97
IPCS889.D	G44-12 H30D55	230.04	9.66	1917.96	330.44
IPCS890.D	G44-13 H30D55	275.66	10.42	2074.13	402.11
IPCS891.D	G44-14 H30D55	267.20	10.98	2047.84	388.83
IPCS892.D	G44-15 H30D55	269.91	10.92	2115.81	394.26
IPCS893.D	G44-06 H30D55	234.44	7.07	1519.88	268.24
	AVG	255.74	10.07	1954.51	352.54
	STD	18.37	1.40	202.75	47.93
	% RSD	7.2	13.9	10.4	13.6
IPCS895.D	SKC BLANK #1 H30D55	61.22	0.00	0.00	0.00
IPCS896.D	SKC BLANK #2 H30D55	123.34	0.00	0.00	0.00
IPCS897.D	SKC BLANK #3 H30D55	57.03	0.00	0.00	0.00
IPCS898.D	S66-10 H30D55	310.62	36.32	1741.80	289.52
IPCS899.D	S66-11 H30D55	324.80	18.52	1726.69	292.26
IPCS901.D	S66-12 H30D55	322.27	21.21	1664.44	283.27
IPCS902.D	S66-13 H30D55	305.85	35.03	1688.81	303.68
IPCS903.D	S66-14 H30D55	312.78	40.51	1796.42	294.60
IPCS904.D	S66-15 H30D55	327.17	38.96	1827.54	302.53
IPCS905.D	S66-16 H30D55	307.35	42.19	1715.38	300.86
	AVG	315.83	33.25	1737.30	295.25
	STD	8.74	9.48	57.61	7.54
	% RSD	2.8	28.5	3.3	2.6
IPCS888.D	STD 1 GD-15, HD-500	0.00	10.72	572.31	0.00
IPCS894.D	STD 2 GD-30, HD-1000	0.00	27.77	1517.95	0.00
IPCS900.D	STD 3 GD-60, HD-2000	0.00	60.95	2389.78	0.00
IPCS906.D	STD 4 GD-120, HD-4000	0.00	120.62	3675.62	0.00

AMPLES RUN ON DAY 58		TMB	GD	HD m/z 160	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS1035.D	STD 1 GD-15, HD-500	2.98	23.12	664.28	6.01
IPCS1036.D	STD 2 GD-30, HD-1000	0.93	33.70	1431.96	0.00
IPCS1037.D	STD 3 GD-60, HD-2000	1.18	69.11	2478.04	0.00
IPCS1038.D	STD 4 GD-120, HD-4000	2.16	95.57	2799.86	1.99
IPCS1039.D	TICS	631.54	5.22	12.01	1263.08
IPCS1040.D	EMPTY TUBE #1	0.00	0.00	0.00	0.00
IPCS1041.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS1042.D	GORE BLANK #1 H44D58	5.51	0.00	4.10	0.00
IPCS1043.D	GORE BLANK #2 H44D58	5.09	0.00	4.05	0.00
IPCS1044.D	GORE BLANK #3 H44D58	2.63	0.00	4.63	0.00
IPCS1045.D	G69-10 H44D58	304.75	11.59	3182.26	1043.63
IPCS1046.D	G69-11 H44D58	323.65	11.98	3218.65	1119.09
IPCS1048.D	G69-12 H44D58	309.00	13.89	3351.52	1247.22
IPCS1049.D	G69-13 H44D58	317.99	12.08	2921.94	1036.39
IPCS1050.D	G69-14 H44D58	252.35	8.28	2594.89	839.67
IPCS1051.D	G69-15 H44D58	326.34	13.72	3252.27	1204.32
IPCS1052.D	G69-16 H44D58	290.34	12.90	2978.47	1113.27
	AVG	303.49	12.06	3071.43	1086.23
	STD	25.69	1.89	259.23	133.39
	% RSD	8.5	15.6	8.4	12.3
IPCS1054.D	SKC BLANK #1 H44D58	39.79	0.00	0.00	0.00
IPCS1055.D	SKC BLANK #2 H44D58	32.44	0.00	4.07	0.00
IPCS1056.D	SKC BLANK #3 H44D58	20.26	0.00	5.37	0.00
IPCS1057.D	S71-10 H44D58	386.35	66.27	2741.06	973.55
IPCS1058.D	S71-11 H44D58	361.65	78.53	2581.98	1067.58
IPCS1060.D	S71-12 H44D58	376.35	70.31	2804.86	1162.55
IPCS1061.D	S71-13 H44D58	385.35	70.97	2821.18	1154.30
IPCS1062.D	S71-14 H44D58	396.55	74.83	2827.84	1146.09
IPCS1063.D	S71-15 H44D58	364.46	68.24	2793.49	1124.79
IPCS1064.D	S71-16 H44D58	372.42	87.01	2911.65	1169.21
	AVG	377.59	73.74	2783.15	1114.01
	STD	12.59	7.14	102.29	70.78
	% RSD	3.3	9.7	3.7	6.4
IPCS1047.D	STD 1 GD-15, HD-500	0.92	13.67	554.81	0.00
IPCS1053.D	STD 2 GD-30, HD-1000	1.51	27.84	1179.22	0.78
IPCS1059.D	STD 3 GD-60, HD-2000	0.54	68.41	2447.96	0.00
IPCS1065.D	STD 4 GD-120, HD-4000	2.30	116.50	3724.36	0.00

Low RT Day 0		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS227.D	STD 1, 0.5	0.74	0.36	0.60	1.01
IPCS228.D	STD 2, 1.0	0.98	1.27	1.49	1.06
IPCS229.D	STD 3, 2.5	2.81	2.66	2.66	2.38
IPCS230.D	STD 4, 5.0	6.24	4.96	4.42	6.27
IPCS231.D	STD 5, 10.0	9.24	9.96	10.20	9.36
IPCS232.D	STD 6, 25.0	17.24	27.77	25.23	21.40
IPCS233.D	BLANK	0.00	0.00	0.00	0.00
IPCS234.D	G75-18 GORE BLANK LRTD0	0.53	0.00	0.00	0.00
IPCS235.D	G75-19 GORE BLANK LRTD0	0.67	0.00	0.00	0.00
IPCS236.D	G75-20 GORE BLANK LRTD0	1.70	0.00	0.00	0.00
IPCS237.D	G74-7 LRTD0	27.23	14.71	6.40	3.43
IPCS238.D	G74-8 LRTD0	26.31	12.89	6.01	3.09
IPCS240.D	G74-9 LRTD0	34.74	15.63	10.10	5.14
IPCS241.D	G74-10 LRTD0	27.84	17.46	6.74	3.47
IPCS242.D	G74-11 LRTD0	30.66	15.23	7.83	4.20
IPCS243.D	G74-12 LRTD0	26.64	16.40	6.77	3.47
IPCS244.D	G74-13 LRTD0	29.61	12.69	7.94	4.05
	AVG	29.00	15.00	7.40	3.84
	STD	2.98	1.75	1.39	0.69
	%RSD	10.3	11.7	18.7	18.0
IPCS246.D	S76-26 SKC BLANK LRTD0	16.10	0.00	0.00	0.00
IPCS247.D	S76-27 SKC BLANK LRTD0	8.69	0.00	0.00	0.00
IPCS248.D	S76-28 SKC BLANK LRTD0	18.54	0.00	0.00	0.00
IPCS249.D	S76-2 LRTD0	27.19	0.00	0.00	0.00
IPCS250.D	S76-3 LRTD0	12.79	0.00	0.00	0.00
IPCS252.D	S76-4 LRTD0	12.03	0.00	0.00	2.41
IPCS253.D	S76-5 LRTD0	39.84	0.00	0.00	0.00
IPCS254.D	S76-6 LRTD0	26.27	0.00	0.00	0.00
IPCS255.D	S76-7 LRTD0	23.16	0.00	0.00	0.00
IPCS256.D	S76-8 LRTD0	18.24	0.00	0.00	0.00
	AVG	22.79	0.00	0.00	0.34
	STD	9.65	0.00	0.00	0.91
	%RSD	42.3	0.0	0.0	264.6
IPCS239.D	STD 1, 0.5	0.62	0.80	0.84	0.84
IPCS245.D	STD 2, 1.0	1.09	1.38	1.66	1.14
IPCS251.D	STD 3, 2.5	1.76	2.88	3.94	1.57
IPCS257.D	STD 4, 5.0	6.23	5.64	6.11	5.89
IPCS258.D	A76150	63.81	41.06	21.53	11.77
IPCS259.D	A57004	66.69	28.82	17.71	8.59

NOTE: EXTERNAL STANDARD USED

Low 30C Day 0 Data File Name	Sample Name	TMB ng	GD ng	HD ng	DDVP ng
IPCS539.D	STD 0.5	0.50	0.53	0.26	0.00
IPCS540.D	STD 1.0	1.08	0.73	0.37	0.61
IPCS541.D	STD 2.5	2.68	2.61	1.53	2.61
IPCS542.D	STD 5.0	6.56	6.22	4.41	1.98
IPCS543.D	STD 10.0	13.75	9.60	4.10	12.91
IPCS544.D	STD 25.0	31.43	37.45	32.19	52.89
IPCS545.D	STD 50.0	33.42	70.92	63.22	42.94
IPCS546.D	BLANK #1	0.06	0.08	0.00	0.00
IPCS547.D	BLANK #2	0.01	0.00	0.00	0.00
IPCS548.D	G86-2 BLANK #1 L30D0	3.93	0.00	0.00	0.00
IPCS549.D	G86-3 BLANK #2 L30D0	4.31	0.00	0.00	0.00
IPCS550.D	G86-4 BLANK #3 L30D0	4.35	0.00	0.00	0.00
IPCS551.D	G85-7 L30D0	2.26	16.11	5.03	3.40
IPCS552.D	G85-8 L30D0	3.74	13.78	4.42	3.06
IPCS554.D	G85-9 L30D0	3.27	14.27	4.27	2.77
IPCS555.D	G85-10 L30D0	4.32	14.21	5.58	3.52
IPCS556.D	G85-11 L44D0	6.63	18.47	5.10	3.43
IPCS557.D	G85-12 L30D0	4.91	19.55	4.81	3.16
IPCS558.D	G85-13 L30D0	3.50	13.17	4.73	3.18
	AVG	4.09	15.65	4.85	3.22
	STD	1.39	2.48	0.44	0.26
	%RSD	34.1	15.9	9.1	8.0
IPCS538.D	587-26 SKC BLANK #1 12-20 AM	1.35	0.00	0.00	0.00
IPCS560.D	S87-27 BLANK #2	1.26	0.00	0.00	0.00
IPCS561.D	S87-28 BLANK #3	6.20	0.00	0.00	0.00
IPCS562.D	S87-2 L30D0	1.32	10.22	2.29	2.09
IPCS563.D	S87-3 L30D0	0.80	8.47	2.94	2.33
IPCS564.D	S87-4 L30D0	1.13	8.62	1.55	1.11
IPCS566.D	S87-5 L30D0	1.37	11.11	2.22	1.89
IPCS567.D	S87-6 L30D0	1.21	9.93	2.71	2.30
IPCS568.D	S87-7 L30D0	1.34	11.61	2.25	2.15
IPCS569.D	S87-8 L30D0	1.01	9.22	1.85	1.71
	AVG	1.17	9.88	2.26	1.94
	STD	0.21	1.20	0.47	0.43
	%RSD	17.7	12.1	20.9	22.0
IPCS571.D	A99644 CHALLENGE #1	7.42	21.83	14.61	23.86
IPCS572.D	A76150 CHALLENGE #2	9.44	18.31	13.42	15.00
IPCS573.D	A64381 CHALLENGE #3	7.81	14.03	11.45	7.40
IPCS574.D	B04331CHALLENGE #4	7.82	14.26	11.85	7.95
IPCS553.D	STD 0.5	0.68	0.50	0.28	0.00
IPCS559.D	STD 1.0	1.40	1.68	1.26	1.11
IPCS565.D	STD 5.0	7.36	4.67	3.75	2.08
IPCS570.D	STD 10	13.40	9.99	6.83	2.19
IPCS575.D	STD 2.5	3.01	2.40	1.41	3.24
IPCS576.D	STD 25	23.10	28.54	26.69	3.18
IPCS577.D	STD 50.0	31.63	48.26	36.10	62.73

Low 44C Day 0		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS306.D	STD 0.5	0.58	1.29	26.82	0.00
IPCS307.D	STD 1.0	0.96	0.00	0.26	0.03
IPCS308.D	STD 2.5	3.64	0.00	0.44	0.00
IPCS309.D	STD 5.0	5.82	0.36	1.27	0.00
IPCS310.D	STD 10.0	14.51	6.37	4.90	6.14
IPCS311.D	STD 25.0	29.98	27.20	20.18	49.13
IPCS312.D	STD 50.0	46.46	50.00	53.92	39.41
IPCS313.D	BLANK	0.00	0.00	0.00	0.00
IPCS314.D	G80-18 GORE BLANK L44D0	13.96	0.00	0.00	0.00
IPCS315.D	G80-19 GORE BLANK L44D0	9.91	0.00	0.24	0.00
IPCS316.D	G80-20 GORE BLANK L44D0	1.99	5.97	0.65	2.35
IPCS317.D	G79-7 L44D0	67.89	0.00	20.22	40.70
IPCS318.D	G79-8 L44D0	59.43	0.00	14.88	30.12
IPCS320.D	G79-9 L44D0	69.33	20.42	18.71	40.27
IPCS321.D	G79-10 L44D0	64.97	22.67	18.45	37.96
IPCS322.D	G79-11 L44D0	64.09	23.51	16.89	34.82
IPCS323.D	G79-12 L44D0	64.21	20.32	17.54	35.48
IPCS324.D	G79-13 L44D0	67.85	23.85	17.66	38.60
	AVG	65.40	15.82	17.76	36.85
	STD	3.33	10.90	1.66	3.70
	%RSD	5.1	68.9	9.3	10.0
IPCS319.D	STD 2.5	3.18	0.35	0.91	0.00
IPCS325.D	STD 5.0	8.24	1.36	3.48	6.29
IPCS328.D	STD 10.0	14.94	5.35	5.10	1.70
IPCS329.D	STD 25.0	29.98	10.32	8.62	20.82
IPCS330.D	STD 50.0	45.38	31.65	32.21	43.22
IPCS331.D	BLANK #2	0.00	0.00	0.00	0.00
IPCS327.D	A80705 LITF SAMPLE #2	72.33	39.25	21.08	60.03
IPCS326.D	B00995 LITF SAMPLE #1	70.53	41.97	23.50	75.80

Low RT Day 14 Data File Name	Sample Name	TMB ng	GD ng	HD ng	DDVP ng
IPCS476.D	STD 0.5	0.70	0.26	0.38	0.52
IPCS477.D	STD 1.0	1.41	4.64	23.90	1.75
IPCS478.D	STD 2.5	2.70	2.84	4.46	5.66
IPCS479.D	STD 5.0	6.86	9.08	29.88	13.74
IPCS480.D	STD 10.0	13.57	7.82	10.12	29.17
IPCS481.D	STD 25.0	26.15	33.46	43.78	76.27
IPCS482.D	BLANK #1	1.55	0.12	0.91	376.00
IPCS483.D	BLANK #2	0.00	23.45	253.02	2.30
IPCS484.D	GORE BLANK #1 LRTD14	2.17	5.87	0.00	0.00
IPCS485.D	GORE BLANK #2 LRTD14	1.99	0.00	0.00	0.00
IPCS486.D	GORE BLANK #3 LRTD14	2.75	0.00	0.00	0.00
IPCS487.D	G74-15 LRTD14	21.72	1.81	6.63	5.76
IPCS488.D	G74-16 LRTD14	27.19	1.81	7.56	7.76
IPCS490.D	G74-17 LRTD14	27.88	2.44	7.97	7.69
IPCS491.D	G74-18 LRTD14	25.99	1.59	7.51	7.08
IPCS492.D	G74-19 LRTD14	25.77	4.79	6.48	7.28
IPCS493.D	G74-20 LRTD14	26.49	1.09	7.55	6.67
IPCS494.D	G74-21 LRTD14	23.66	3.39	6.19	5.16
	AVG	25.5	2.4	7.1	6.8
	STD	2.1	1.3	0.7	1.0
	% RSD	8.4	52.8	9.5	14.5

IPCS489.D	STD 5.0	5.56	3.86	6.01	12.84
IPCS495.D	STD 10	10.23	13.68	141.84	22.88
IPCS496.D	STD 25	20.70	16.47	21.08	56.56
IPCS522.D	GORE BLANK #1 LRTD16	1.36	0.00	0.00	0.00
IPCS523.D	GORE BLANK #2 LRTD16	1.32	0.00	0.00	0.00
IPCS524.D	GORE BLANK #3 LRTD16	1.31	0.00	0.00	0.00
IPCS525.D	G74-15 LRTD16	27.43	10.23	5.70	1.91
IPCS526.D	G74-16 LRTD16	32.67	6.46	6.29	2.67
IPCS528.D	G74-17 LRTD16	31.50	7.15	5.95	2.62
IPCS529.D	G74-18 LRTD16	27.74	9.11	5.66	2.26
IPCS530.D	G74-19 LRTD16	29.68	8.78	5.45	2.62
IPCS531.D	G74-20 LRTD16	30.29	10.65	5.97	2.71
IPCS532.D	G74-21 LRTD16	28.39	8.64	4.94	2.27
	AVG	29.7	8.7	5.7	2.4
	STD	2.0	1.5	0.4	0.3
	% RSD	6.6	17.4	7.6	12.2

14 day samples after 16 days

Low 44C Day 14 Data File Name	Sample Name	TMB ng	GD ng	HD ng	DDVP ng
IPCS715.D	STD 0.5	1.17	0.77	1.82	1.04
IPCS716.D	STD 1.0	0.73	1.30	1.56	0.44
IPCS717.D	STD 2.5	1.88	1.89	2.05	0.28
IPCS718.D	STD 5.0	5.69	5.20	5.60	7.45
IPCS719.D	STD 10.0	10.66	8.52	6.45	6.32
IPCS720.D	STD 25.0	24.55	25.37	25.45	26.23
IPCS721.D	EMPTY TUBE #1	0.03	0.06	0.00	0.00
IPCS722.D	EMPTY TUBE #2	0.04	0.10	0.00	0.00
IPCS723.D	GORE BLANK #1 L30D14	5.85	0.00	0.00	0.00
IPCS724.D	GORE BLANK #2 L30D14	4.32	0.00	0.00	0.00
IPCS725.D	GORE BLANK #3 L30D14	5.15	0.00	0.00	0.00
IPCS726.D	G85-15 L30D14	4.15	0.00	9.13	8.48
IPCS727.D	G85-16 L30D14	5.33	0.00	10.18	4.65
IPCS729.D	G85-17 L30D14	4.00	0.00	9.19	7.00
IPCS730.D	G85-18 L30D14	4.10	0.00	9.04	6.20
IPCS731.D	G85-19 L30D14	4.64	0.00	8.70	5.40
IPCS732.D	G85-20 L30D14	3.89	0.00	9.89	3.89
IPCS733.D	G85-21 L30D14	4.04	0.00	9.74	6.50
	AVG	4.31	0.00	9.41	6.02
	STD	0.51	0.00	0.53	1.53
	% RSD	11.9		5.7	25.5
IPCS735.D	SKC BLANK #1	1.94	0.00	0.00	0.00
IPCS736.D	SKC BLANK #2	2.08	0.00	0.00	0.00
IPCS737.D	SKC BLANK #3	2.83	0.00	0.00	0.00
IPCS741.D	S87-12 L30D14	2.91	7.39	4.88	0.00
IPCS742.D	S87-13 L30D14	2.62	6.17	4.84	0.00
IPCS743.D	S87-14 L30D14	2.09	6.58	6.18	3.43
IPCS744.D	S87-15 L30D14	2.61	6.22	4.06	3.71
IPCS745.D	S87-16 L30D14	3.15	4.87	4.82	0.00
	AVG	2.68	6.25	4.96	1.43
	STD	0.40	0.91	0.76	1.96
	% RSD	14.8	14.6	15.4	137.1
IPCS728.D	STD 0.5	0.54	0.39	0.51	0.50
IPCS734.D	STD 1.0	0.85	0.99	0.87	1.43
IPCS740.D	STD 2.5	3.57	1.75	2.24	2.37
IPCS746.D	STD 5.0	5.51	5.23	6.88	12.39
IPCS747.D	STD 10	10.16	7.69	14.45	15.19
IPCS748.D	STD 25	20.86	24.02	34.14	40.93

Low 44C Day 14		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS500.D	STD 0.5	1.72	0.36	0.18	0.00
IPCS501.D	STD 1.0	1.48	0.97	0.84	0.65
IPCS502.D	STD 2.5	3.24	2.05	1.99	1.74
IPCS503.D	STD 5.0	6.61	5.39	4.34	3.53
IPCS504.D	STD 10.0	14.05	10.25	9.70	10.32
IPCS505.D	STD 25.0	26.90	26.61	25.04	22.92
IPCS506.D	STD 50.0	48.02	49.13	50.14	51.17
IPCS507.D	BLANK EMPTY TUBE#1	0.00	0.00	0.00	0.00
IPCS508.D	BLANK EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS509.D	GORE BLANK #1 L44D14	0.00	0.00	0.00	0.00
IPCS510.D	GORE BLANK #2 L44D14	1.72	0.00	0.00	0.00
IPCS511.D	GORE BLANK #3 L44D14	1.68	0.00	0.00	0.00
IPCS512.D	G79-15 L44D14	52.75	8.79	16.81	7.08
IPCS513.D	G79-16 L44D14	55.86	4.87	17.89	6.04
IPCS515.D	G79-17 L44D14	52.73	4.04	16.19	6.05
IPCS516.D	G79-18 L44D14	53.31	4.73	16.36	4.63
IPCS517.D	G79-19 L44D14	64.03	0.00	22.66	6.33
IPCS518.D	G79-20 L44D14	54.79	6.24	16.81	4.64
IPCS519.D	G79-21 L44D14	53.23	4.26	14.99	4.90
	AVG	55.2	4.7	17.4	5.7
	STD	4.0	2.6	2.5	1.0
	% RSD	7.3	56.1	14.3	16.8
IPCS534.D	LITF CONC CHECK 12-19 PM	7.11	20.37	6.63	2.35
IPCS514.D	STD 0.5	1.30	0.44	0.37	0.42
IPCS520.D	STD 1.0	2.22	0.75	0.85	0.86
IPCS521.D	STD 2.5	4.02	2.02	1.94	2.07
IPCS527.D	STD 5.0	5.98	5.44	5.41	4.17
IPCS533.D	STD 10	14.67	8.71	9.19	11.73
IPCS535.D	STD 25	28.92	22.32	19.12	30.56
IPCS536.D	STD 50.0	36.33	36.26	39.33	12.85

Low Room Temp Day 28		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	NG	ng
IPCS679.D	EMPTY TUBE	0.01	0.00	0.01	0.00
IPCS680.D	EMPTY TUBE	0.00	0.01	0.00	0.00
IPCS681.D	STD 0.5	0.56	0.46	0.62	0.55
IPCS682.D	STD 1.0	1.22	1.15	0.83	1.22
IPCS683.D	STD 2.5	3.56	2.69	2.63	3.98
IPCS684.D	STD 5.0	8.92	6.26	6.54	7.82
IPCS685.D	STD 10.0	12.45	9.66	9.12	10.69
IPCS686.D	STD 25.0	23.12	25.90	25.03	24.00
IPCS687.D	EMPTY TUBE #1	0.02	0.00	0.00	0.00
IPCS688.D	EMPTY TUBE #2	0.01	0.00	0.00	0.00
IPCS689.D	GORE BLANK #1 LRTD28	3.58	0.00	0.00	0.00
IPCS690.D	GORE BLANK #2 LRTD28	3.47	0.00	0.00	0.00
IPCS691.D	GORE BLANK #3 LRTD28	2.95	0.00	0.00	0.00
IPCS692.D	G74-23 LRTD28	26.58	0.00	4.79	3.21
IPCS693.D	G74-24 LRTD28	25.50	0.00	4.43	3.05
IPCS695.D	G74-25 LRTD28	24.86	0.00	4.07	2.73
IPCS696.D	G74-26 LRTD28	24.10	0.00	4.62	5.16
IPCS697.D	G74-27 LRTD28	15.36	0.00	2.69	2.33
IPCS698.D	G74-28 LRTD28	20.75	0.00	3.97	2.45
IPCS699.D	G74-29 LRTD28	27.44	0.00	4.89	3.68
	AVG	23.5	0.0	4.2	3.2
	STD	4.2	0.0	0.8	1.0
	% RSD	17.8	0.0	17.9	30.0
IPCS694.D	STD 5.0	5.49	2.80	2.78	0.59
IPCS700.D	STD 10	9.94	6.66	5.92	4.59

Data File Name	Sample Name	TMB ng	GD ng	HD ng	DDVP ng
IPCS1001.D	STD 0.5	0.61	0.53	0.43	0.21
IPCS1002.D	STD 1.0	0.89	1.06	0.77	0.24
IPCS1003.D	STD 2.5	2.66	2.56	1.98	1.31
IPCS1004.D	STD 5.0	6.40	5.00	4.53	2.40
IPCS1005.D	STD 10.0	11.48	12.24	11.86	11.02
IPCS1006.D	STD 25.0	24.60	14.06	6.46	16.10
IPCS1007.D	EMPTY TUBE #1	0.17	0.00	0.00	0.00
IPCS1008.D	EMPTY TUBE #2	0.12	0.00	0.00	0.00
IPCS1009.D	GORE BLANK #1 L30D27	1.57	0.00	0.00	0.00
IPCS1010.D	GORE BLANK #2 L30D27	1.55	0.00	0.00	0.00
IPCS1011.D	GORE BLANK #3 L30D27	1.48	0.00	0.00	0.00
IPCS1012.D	G85-23 L30D27	1.30	0.00	2.92	2.17
IPCS1013.D	G85-24 L30D27	1.17	0.00	2.90	2.08
IPCS1015.D	G85-25 L30D27	1.76	0.00	2.97	3.10
IPCS1016.D	G85-26 L30D27	1.30	0.00	2.61	2.44
IPCS1017.D	G85-27 L30D27	1.35	0.00	2.69	2.83
IPCS1018.D	G85-28 L30D27	1.15	0.00	2.50	2.84
IPCS1019.D	G85-29 L30D27	1.65	0.00	3.00	3.16
	AVG	1.4	0.0	2.8	2.7
	STD	0.2	0.0	0.2	0.4
	% RSD	16.9	0.0	7.0	16.3
IPCS1021.D	SKC BLANK #1 L30D27	7.64	0.00	0.00	0.00
IPCS1022.D	SKC BLANK #2 L30D27	7.99	0.00	0.00	0.00
IPCS1023.D	SKC BLANK #3 L30D27	8.92	0.00	0.00	0.00
IPCS1024.D	S87-18 L30D27	6.97	2.28	1.68	1.04
IPCS1025.D	S87-19 L30D27	8.02	3.13	1.22	2.45
IPCS1027.D	S87-20 L30D27	8.18	5.57	1.86	1.57
IPCS1028.D	S87-21 L30D27	7.66	3.49	1.24	0.93
IPCS1029.D	S87-22 L30D27	8.34	4.54	1.46	1.20
IPCS1030.D	S87-23 L30D27	7.39	3.51	1.33	1.55
IPCS1031.D	S87-24 L30D27	6.51	0.00	1.26	0.00
	AVG	7.6	3.2	1.4	1.2
	STD	0.7	1.8	0.2	0.7
	% RSD	8.8	54.8	17.2	59.8
IPCS1014.D	STD 0.5	0.51	0.56	0.57	0.14
IPCS1020.D	STD 1.0	1.04	1.08	0.69	0.27
IPCS1026.D	STD 2.5	2.82	2.52	2.32	2.20
IPCS1032.D	STD 5.0	5.60	4.94	3.82	3.97
IPCS1033.D	STD 10	12.39	9.13	6.36	15.91
IPCS1034.D	STD 25	23.89	25.35	25.26	25.31

Low 44 C Day 28		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS681.D	STD 0.5	0.56	0.46	0.62	0.55
IPCS682.D	STD 1.0	1.22	1.15	0.83	1.22
IPCS683.D	STD 2.5	3.56	2.69	2.63	3.98
IPCS684.D	STD 5.0	8.92	6.26	6.54	7.82
IPCS685.D	STD 10.0	12.45	9.66	9.12	10.69
IPCS686.D	STD 25.0	23.12	25.90	25.03	24.00
IPCS700.D	STD 10	9.94	6.66	5.92	4.59
IPCS701.D	GORE BLANK #1 L44D28	2.30	0.00	0.00	0.00
IPCS702.D	GORE BLANK #2 L44D28	3.03	0.00	0.00	0.00
IPCS703.D	GORE BLANK #3 L44D28	3.39	0.00	0.00	0.00
IPCS704.D	G79-23 L44D28	37.91	9.69	14.58	4.85
IPCS705.D	G79-24 L44D28	37.65	8.72	15.03	5.12
IPCS707.D	G79-25 L44D28	38.42	8.33	14.29	6.65
IPCS708.D	G79-26 L44D28	33.16	8.50	11.90	5.22
IPCS709.D	G79-27 L44D28	39.49	8.33	15.18	5.85
IPCS710.D	G79-28 L44D28	40.32	10.39	16.83	5.75
IPCS711.D	G79-29 L44D28	36.91	7.25	15.84	5.48
	AVG	37.69	8.74	14.81	5.56
	STD	2.30	1.02	1.53	0.60
	% RSD	6.1	11.7	10.4	10.7
IPCS706.D	STD 0.5	0.70	0.27	0.22	0.00
IPCS712.D	STD 1.0	1.03	0.58	0.41	0.00
IPCS713.D	STD 2.5	2.46	1.52	1.06	0.28
IPCS714.D	STD 25.0	17.87	13.37	13.45	3.50

Low Room Temp Day 42		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS953.D	STD 0.5	0.79	0.48	0.49	0.59
IPCS954.D	STD 1.0	0.84	0.78	1.46	0.47
IPCS955.D	STD 2.5	2.41	2.95	4.10	4.17
IPCS956.D	STD 5.0	5.62	4.98	4.80	8.97
IPCS957.D	STD 10.0	13.44	13.79	19.40	29.53
IPCS958.D	STD 25.0	23.51	23.45	24.86	24.06
IPCS959.D	EMPTY TUBE #1	0.21	0.07	0.00	0.00
IPCS960.D	EMPTY TUBE #2	0.32	0.00	0.00	0.00
IPCS961.D	GORE BLANK #1 LRTD42	0.76	0.00	0.00	0.00
IPCS962.D	GORE BLANK #2 LRTD42	1.07	0.00	0.00	0.00
IPCS963.D	GORE BLANK #3 LRTD42	0.76	0.00	0.00	0.00
IPCS964.D	G75-2 LRTD42	34.02	0.00	12.66	20.04
IPCS965.D	G75-3 LRTD42	39.66	0.00	14.69	18.02
IPCS968.D	G75-4 LRTD42	22.66	0.00	3.42	11.50
IPCS969.D	G75-5 LRTD42	28.75	0.00	12.54	10.60
IPCS970.D	G75-6 LRTD42	34.52	0.00	13.59	9.92
IPCS971.D	G75-7 LRTD42	35.40	0.00	12.99	11.01
IPCS972.D	G75-8 LRTD42	29.96	0.00	11.44	11.18
	AVG	32.14	0.00	11.62	13.18
	STD	5.52	0.00	3.75	4.07
	% RSD	17.2		32.3	30.9
IPCS966.D	STD 0.5	0.67	0.84	1.26	1.46
IPCS967.D	STD 1.0	1.30	1.55	1.62	1.66
IPCS973.D	STD 2.5	2.63	3.17	3.42	4.81
IPCS974.D	STD 5.0	5.83	5.71	6.17	7.59
IPCS975.D	STD 10	10.80	11.57	10.78	13.97
IPCS976.D	STD 25.0	27.11	33.35	45.79	74.79

Low 44 C Day 41		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS977.D	STD 0.5	0.78	0.53	0.62	0.52
IPCS978.D	STD 1.0	1.01	0.98	0.81	0.90
IPCS979.D	STD 2.5	2.98	2.41	2.28	2.73
IPCS980.D	STD 5.0	5.85	5.11	4.92	5.77
IPCS981.D	STD 10.0	12.65	10.56	10.75	11.64
IPCS982.D	STD 25.0	23.72	25.29	24.74	24.17
IPCS983.D	EMPTY TUBE#1	0.06	0.00	0.00	0.00
IPCS984.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS985.D	GORE BLANK #1 L44D41	1.98	0.00	0.00	0.00
IPCS986.D	GORE BLANK #2 L44D41	1.29	0.00	0.00	0.00
IPCS987.D	GORE BLANK #3 L44D41	0.00	0.00	0.00	0.00
IPCS988.D	G80-2 L44D41	55.74	2.36	10.06	6.00
IPCS989.D	G80-3 L44D41	62.19	5.69	13.01	7.51
IPCS992.D	G80-4 L44D41	56.97	3.44	11.67	6.94
IPCS993.D	G80-5 L44D41	67.13	2.90	14.11	8.17
IPCS994.D	G80-6 L44D41	60.32	3.42	12.48	7.20
IPCS995.D	G80-7 L44D41	56.99	3.53	11.24	7.55
IPCS996.D	G80-8 L44D41	67.95	5.41	12.52	8.51
	AVG	61.04	3.82	12.16	7.41
	STD	4.96	1.25	1.31	0.82
	% RSD	8.1	32.7	10.8	11.1
IPCS990.D	STD 0.5	0.57	0.46	0.60	0.45
IPCS991.D	STD 1.0	1.23	1.03	1.00	1.19
IPCS997.D	STD 2.5	2.64	2.02	1.98	2.60
IPCS998.D	STD 5.0	6.00	4.89	4.24	5.73
IPCS999.D	STD 10.0	14.85	10.56	10.07	15.23
IPCS1000.D	STD 25.0	25.64	25.18	25.54	28.51

LRTD57		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS1155.D	STD 0.5	0.76	0.48	0.37	0.37
IPCS1156.D	STD 1.0	1.06	0.85	1.25	0.13
IPCS1157.D	STD 2.5	2.33	2.67	2.73	0.50
IPCS1158.D	STD 5.0	5.36	4.01	4.02	0.65
IPCS1159.D	STD 10.0	9.31	9.14	9.63	3.32
IPCS1160.D	STD 25.0	17.88	29.23	31.01	10.69
IPCS1161.D	EMPTY TUBE #1	0.22	0.00	0.00	0.00
IPCS1162.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS1163.D	GORE BLANK #1 LRTD57	1.00	0.00	0.00	0.00
IPCS1164.D	GORE BLANK #2 LRTD57	0.79	0.00	0.00	0.00
IPCS1165.D	GORE BLANK #3 LRTD57	1.03	0.00	0.00	0.00
IPCS1166.D	G75-10 LRTD57	27.35	0.00	6.53	0.84
IPCS1167.D	G75-11 LRTD57	27.65	0.00	5.83	1.61
IPCS1169.D	G75-12 LRTD57	28.47	0.00	6.19	1.21
IPCS1170.D	G75-13 LRTD57	29.49	0.00	6.53	1.57
IPCS1171.D	G75-14 LRTD57	29.63	0.00	6.30	2.16
IPCS1172.D	G75-15 LRTD57	22.27	0.00	0.46	1.59
IPCS1173.D	G75-16 LRTD57	27.63	0.00	5.32	1.44
	AVG	27.50	0.00	5.31	1.49
	STD	2.48	0.00	2.18	0.40
	% RSD	9.0		41.1	27.2
IPCS1168.D	STD 0.5	0.81	0.32	0.55	0.27
IPCS1174.D	STD 1.0	1.14	1.31	1.07	0.80
IPCS1180.D	STD 2.5	2.28	1.87	2.68	1.66
IPCS1186.D	STD 5.0	5.05	5.27	4.89	5.62
IPCS1187.D	STD 10	9.65	11.78	16.48	10.31
IPCS1188.D	STD 25.0	21.01	36.08	41.19	28.38

CURVE IS 0.5 TO 5 ng

L44D55		TMB	GD	HD	DDVP
Data File Name	Sample Name	ng	ng	ng	ng
IPCS1155.D	STD 0.5	0.22	0.35	0.05	0.00
IPCS1156.D	STD 1.0	1.23	0.59	0.77	0.12
IPCS1157.D	STD 2.5	2.69	1.91	2.00	0.45
IPCS1158.D	STD 5.0	6.21	2.86	2.48	0.58
IPCS1159.D	STD 10.0	10.78	6.52	5.94	2.97
IPCS1160.D	STD 25.0	20.72	20.87	19.13	9.57
IPCS1174.D	STD 1.0	1.32	0.93	0.66	0.76
IPCS1175.D	GORE BLANK #1 L44D55	1.33	0.00	0.00	0.00
IPCS1176.D	GORE BLANK #2 L44D55	1.04	0.00	0.00	0.00
IPCS1177.D	GORE BLANK #3 L44D55	0.74	0.00	0.00	0.00
IPCS1178.D	G80-10 L44D55	65.14	0.00	14.71	3.88
IPCS1179.D	G80-11 L44D55	59.03	0.00	11.30	5.19
IPCS1181.D	G80-12 L44D55	57.60	0.00	13.05	4.04
IPCS1182.D	G80-13 L44D55	62.64	0.00	13.64	5.98
IPCS1183.D	G80-14 L44D55	58.91	0.00	12.44	4.64
IPCS1184.D	G80-15 L44D55	57.37	0.00	10.93	7.92
IPCS1185.D	G80-16 L44D55	59.56	0.00	13.02	5.98
	AVG	60.04	0.00	12.73	5.38
	STD	2.84	0.00	1.31	1.40
	% RSD	4.7		10.3	26.1
IPCS1180.D	STD 2.5	2.64	1.34	1.65	1.49
IPCS1186.D	STD 5.0	5.85	3.76	3.02	5.03
IPCS1187.D	STD 10	11.18	9.00	10.17	9.23
IPCS1188.D	STD 25.0	24.34	25.76	25.41	25.40

CURVE IS 2.5 TO 25

INTERFERENT TESTS

Data File Name	Sample Name	TMB ng	GD ng	HD ng	DDVP ng
IPCS909.D	STD 0.5	1.31	0.44	0.50	0.25
IPCS910.D	STD 1	1.36	0.67	0.59	0.52
IPCS911.D	STD 2.5	2.74	2.02	1.92	1.64
IPCS912.D	STD 5	8.04	4.36	3.62	5.44
IPCS913.D	STD 10	14.32	9.08	8.60	8.98
IPCS914.D	STD 25	31.12	28.04	26.81	23.74
IPCS915.D	STD 50	45.75	48.65	49.59	50.84
IPCS916.D	EMPTY TUBE #1	0.04	0.00	0.00	0.00
IPCS917.D	EMPTY TUBE #2	0.00	0.00	0.00	0.00
IPCS918.D	G92-22 GORE BLANK	7.22	0.00	0.00	0.00
IPCS919.D	G92-23 GORE BLANK	11.83	0.00	0.00	0.00
IPCS920.D	G92-24 GORE BLANK	9.62	0.00	0.00	0.00
IPCS921.D	G92-15	0.00	0.00	0.00	0.00
IPCS922.D	G92-16	0.00	0.00	0.00	0.00
IPCS924.D	G92-17	0.00	0.00	0.00	0.00
IPCS925.D	G92-18	0.00	0.00	0.00	0.00
IPCS926.D	G92-19	0.00	0.00	0.00	0.00
IPCS927.D	G92-20	0.00	0.00	0.00	0.00
IPCS928.D	G92-21	0.00	0.00	0.00	0.00
IPCS930.D	S93-9 SKC BLANK	8.72	0.00	0.00	0.00
IPCS931.D	S93-10 SKC BLANK	7.90	0.00	0.00	0.00
IPCS932.D	S93-11 SKC BLANK	10.27	0.00	0.00	0.00
IPCS933.D	S93-2	0.00	0.00	0.00	0.00
IPCS934.D	S93-3	0.00	0.00	0.00	0.00
IPCS936.D	S93-4	0.00	0.00	0.00	0.00
IPCS937.D	S93-5	0.00	0.00	0.00	0.00
IPCS938.D	S93-6	0.00	0.00	0.00	0.00
IPCS939.D	S93-7	0.00	0.00	0.00	0.00
IPCS940.D	S93-8	0.00	0.00	0.00	0.00
IPCS942.D	CHAMBER 15 MIN	0.00	0.00	0.00	0.00
IPCS943.D	CHAMBER 45 MIN	0.00	0.00	0.00	0.00
IPCS944.D	CHAMBER 75 MIN	0.00	0.00	0.00	0.00
IPCS923.D	STD 0.5	2.26	0.58	0.33	0.00
IPCS929.D	STD 1	2.38	0.77	0.42	0.00
IPCS935.D	STD 2.5	5.47	2.40	1.56	3.44
IPCS941.D	STD 5	10.06	4.40	3.58	3.21
IPCS945.D	STD 10	16.73	9.55	8.13	5.56
IPCS946.D	STD 25	35.49	24.49	23.57	18.36
IPCS947.D	STD 50	76.60	56.89	50.80	46.55

Face Velocity		GD	HD
		ng	ng
IPCS837.D	EMPTY TUBE #1	0.00	0.00
IPCS838.D	EMPTY TUBE #2	0.00	0.00
IPCS839.D	BLANK 90-11-40	0.00	0.00
IPCS840.D	BLANK 90-12-40	0.00	0.00
IPCS841.D	BLANK 90-13-40	0.00	0.00
IPCS867.D	A71603 15MIN 10	21.36	9.07
IPCS869.D	B03043 45MIN 10	22.10	7.03
IPCS870.D	A44182 15MIN 20	0.00	0.00
IPCS871.D	A99630 45MIN 20	24.13	7.44
IPCS872.D	A86931 15MIN 40	16.56	7.10
IPCS873.D	B10286 45MIN 40	17.86	7.85
IPCS842.D	GORE 88-9-10	0.84	6.41
IPCS846.D	GORE 88-10-10	2.22	6.76
IPCS849.D	GORE 88-11-10	0.00	7.45
IPCS853.D	GORE 88-12-10	0.00	5.45
IPCS857.D	GORE 88-13-10	1.63	5.39
IPCS860.D	GORE 88-14-10	0.00	5.96
IPCS864.D	GORE 88-15-10	2.14	5.98
IPCS843.D	GORE 89-4-20	0.00	5.07
IPCS847.D	GORE 89-5-20	1.23	5.65
IPCS851.D	GORE 89-6-20	0.94	6.11
IPCS854.D	GORE 89-7-20	1.46	5.76
IPCS858.D	GORE 89-8-20	1.17	5.95
IPCS861.D	GORE 89-9-20	1.76	6.04
IPCS865.D	GORE 89-10-20	0.00	5.32
IPCS845.D	GORE 90-4-40	1.37	7.66
IPCS848.D	GORE 90-5-40	0.00	8.81
IPCS852.D	GORE 90-6-40	0.81	6.79
IPCS855.D	GORE 90-7-40	0.73	7.09
IPCS859.D	GORE 90-8-40	0.00	8.16
IPCS863.D	GORE 90-9-40	0.00	7.00
IPCS866.D	GORE 90-10-40	0.00	7.29
IPCS830.D	STD 0.5	0.47	0.45
IPCS831.D	STD 1.0	0.86	0.45
IPCS832.D	STD 2.5	2.35	1.88
IPCS833.D	STD 5.0	4.48	2.90
IPCS834.D	STD 10.0	9.32	6.34
IPCS835.D	STD 25.0	31.97	34.25
IPCS836.D	STD 50	50.20	50.99
IPCS844.D	STD 0.5	0.46	0.47
IPCS850.D	STD 1.0	0.99	0.80
IPCS856.D	STD 2.5	2.37	2.03
IPCS862.D	STD 5.0	3.81	2.44
IPCS868.D	STD 10	10.56	9.14
IPCS874.D	STD 25	23.98	20.93
IPCS875.D	STD 50	40.22	41.63

10 DAYS EXP TO d8 TOLUENE

Data File Name		TOLUENE d8 AREA	ng
IPCS611.D	SKC IN FOIL **	31017518	141
IPCS612.D	SKC NO FOIL #1	81024494	368
IPCS613.D	SKC NO FOIL #2	79491148	361
IPCS614.D	SKC NO FOIL #3	93489382	425
IPCS782.D	EMPTY TUBE	0	
IPCS783.D	GORE #1	260242740	1183
IPCS784.D	GORE #2	44780079	204
IPCS785.D	SKC #1	4404659	20
IPCS786.D	SKC #2	6537266	30

4 ng = approx 880000

** LOOKED LIKE A BAD SEAL ON FOIL

	IS TIC AREA	TOTAL TIC AREA	TOTAL ng	DATE RUN
EMPTY TUBE	3391233	58319470	69	12/03/01
GORE BLK LRTD0	3391233	1121577789	1323	12/03/01
GORE BLK LRTD0	3391233	1162600408	1371	12/03/01
GORE BLK LRTD0	3391233	1293137033	1525	12/03/01
SKC BLK LRTD0	3391233	5523358907	6515	12/04/01
SKC BLK LRTD0	3391233	6778598409	7995	12/04/01
SKC BLK LRTD0	3391233	5695444277	6718	12/04/01
BLANK	4097139	37994250	37	12/05/01
BLANK #2	4386241	68463647	62	12/06/01
GORE BLANK L44DO	4241690	1202593220	1134	12/05/01
GORE BLANK L44DO	4241690	1386100010	1307	12/05/01
GORE BLANK L44DO	4241690	1653821883	1560	12/05/01
NEW FOCUSING TUBE 12/11/01 & ROTOR IN ATD				
BLANK #1	5164484	64841275	50	12/20/01
BLANK #2	5342995	67854360	51	12/20/01
GORE BLANK L30D0	5342995	1557011276	1166	12/20/01
GORE BLANK L30D0	5342995	1712290379	1282	12/20/01
GORE BLANK L30D0	5342995	1949473193	1459	12/20/01
SKC BLANK L30D0	5342995	2244416444	1680	12/20/01
SKC BLANK L30D0	5342995	2229384006	1669	12/21/01
SKC BLANK L30D0	5342995	2851375952	2135	12/21/01
NEW FOCUSING TUBE 1/08/02				
90-12-40	5940505	3657619939	2463	01/08/01
90-11-40	5940505	3420693662	2303	01/09/02
90-13-40	5940505	3793919866	2555	01/09/02
90-12-40	5940505	5049890264	3400	01/09/02
EMPTY TUBE	3857195	64474922	67	01/11/02
EMPTY TUBE	4771237	80099026	67	01/11/02
GORE BLK G92-22	4314216	3107077308	2881	01/11/02
GORE BLK G92-23	4314216	4713652984	4370	01/11/02
GORE BLK G92-24	4314216	6382397316	5918	01/11/02
SKC BLK S93-10	4314216	3676713475	3409	01/12/02
SKC BLK S93-11	4314216	4251355482	3942	01/12/02
SKC BLK S93-9	4314216	4524603512	4195	01/12/02
NEW FOCUSING TUBE AND COLUMN 1/14/02				
EMPTY TUBE	3106821	28119260	36	01/14/02
EMPTY TUBE	3440544	33217393	39	01/14/02
GORE BLK LRTD42	3273683	664330781	812	01/14/02
GORE BLK LRTD42	3273683	905118473	1106	01/14/02
GORE BLK LRTD42	3273683	1210208910	1479	01/14/02
EMPTY TUBE	2620008	13861550	21	01/15/02
EMPTY TUBE	2954953	21343078	29	01/15/02
GORE BLK L44D41	2787481	770987406	1106	01/15/02
GORE BLK L44D41	2787481	1053671031	1512	01/15/02
GORE BLK L44D41	2787481	1084706736	1557	01/15/02
EMPTY TUBE	2634643	13004273	20	01/16/02
EMPTY TUBE	2436211	14916214	24	01/16/02
GORE BLK L30D27	2535427	567969300	896	01/16/02
GORE BLK L30D27	2535427	803184288	1267	01/16/02
GORE BLK L30D27	2535427	890465727	1405	01/16/02
SKC BLK L30D27	2535427	1637341695	2583	01/16/02
SKC BLK L30D27	2535427	2244296894	3541	01/16/02
SKC BLK L30D27	2535427	2792044672	4405	01/16/02
EMPTY TUBE	2049879	12402337	24	01/29/02
EMPTY TUBE	2107996	14910780	28	01/29/02
GORE BLK LRTD57	2078938	398081032	766	01/29/02
GORE BLK LRTD57	2078938	406203739	782	01/29/02
GORE BLK LRTD57	2078938	437806060	842	01/29/02
EMPTY TUBE	5248054	61618429	47	02/14/02
EMPTY TUBE	5067532	463129072	366	02/14/02
EMPTY TUBE	5075460	276134632	218	02/14/02
EMPTY TUBE	5331438	71264816	53	02/14/02
EMPTY TUBE	5248054	64618429	49	02/14/02
GORE BLK REC 12/01	5194108	3000360686	2311	02/14/02
GORE BLK REC 12/01	5194108	2756760135	2123	02/14/02
GORE BLK REC 12/01	5194108	2242399212	1727	02/14/02
GORE BLK REC 12/01	5194108	2457165518	1892	02/14/02
SKC BLANK 11/03	5194108	8026088137	6181	02/13/02
SKC BLANK 11/03	5194108	7711760924	5939	02/13/02
SKC BLANK 11/03	5194108	4846205614	3732	02/14/02

Appendix C
Field Test Report Fort A.P. Hill

Final Report

On

Force Medical Protection Advanced Concept Technology Demonstration
Fort A.P. Hill Field Exercise November 14- 16

To

US Marine Corps System Command (MARCORSYSCOM)

February 7, 2001

By

BD Lerner, RK Smith, CA McKay, LA Hernon-Kenny, TH Danison

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ABBREVIATIONS/ACRONYMS

ACTD	*Advanced Concept Technology Demonstration*
ASAP	*As soon as possible*
ATD-400	*A thermal desorption device that is manufactured by Perkin-Elmer Corporation*
CA	*Chemical Agent*
CB	*Chemical-biological (usually modifies the word agent)*
COTS	*Commercial Off-the-Shelf*
CBIS	*Chemical Biological Individual Sampler*
FMP	*Force Medical Protection*
GC	*Gas chromatograph*
GD	*Chemical agent Soman (Pinacolyl methyl phosphonofluoridate)*
IPCS	*Individual Passive Chemical Sampler*
IDLH	*Immediately dangerous to life and health*
MARCORSYSCOM	*Marine Corps Systems Command*
MES	*Methyl Salicylate (Oil of Wintergreen), a common chemical simulant for HD*
MSD	*Mass Selective Detector; an Agilent Corporation Mass Spectrometer specifically designed for use as a GC detector.*
ORI	*Operational Readiness Inspection*
P-E	*Perkin-Elmer Corporation*
PPE	*Personal Protective Equipment (e.g. respirator, suit, boots, and gloves)*
RH	*Relative humidity, percent*
SKC	*SKC Corporation*
SOP	*Standard Operating Procedure*
TIC	*Toxic Industrial Chemical*
TMB	*Trimethyl Benzene*
TWA	*Time-weighted average (maximum allowed concentration for unprotected full-shift occupational exposure)*

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1.0 INTRODUCTION

Currently a true integrated Nuclear - Biological – Chemical (NBC) defense and force health protection system that is designed to sample low levels of chemical agent exposure does not exist. These low levels are below those that would cause immediate symptoms, and are below the levels found by the CA detectors currently used in the field. In addition these CA detectors generally do not respond to toxic industrial chemicals (TIC), which also are a threat to the health of the warfighter. This lack of information seriously impedes the force commander's ability to make informed decisions in the field about contamination avoidance or force protection. Further, the force medical protection community lacks the means to measure and record the individual warfighter's exposure to low levels of CB agent or TICs. This information is crucial to assess the risk to individuals to continued low-level exposure and to diagnose near and long term health monitoring and treatment programs.

The CBIS concept addresses this need by evaluating the presence and/or absence of CB agents or TICs. The CBIS system will provide non-intrusive capability to measure sub-clinical exposures to these toxic materials and provide exposure data for health surveillance.

1.1 BACKGROUND

Initial CBIS activities are designed around the use of commercial Individual Passive Chemical Sampler (IPCS). These samplers are intended for use by workers in industrial environments. The samplers are generally constructed as small, wearable badges that contain Tenax, which is a commonly used wide-spectrum absorbent for air-borne materials.

The environment of the warfighter is, bluntly stated, chemically dirty. In addition to normal environmental contaminants like dust, there are vehicle fumes, fuel vapors, gases from fired weapons, and miscellaneous materials like smoke obscurants. In addition to military contaminates, there are harmful environmental contaminates likes pesticides, polychlorinated biphenyls and toxic industrial chemicals.

As indicated earlier, one of the other goals of the CBIS concept is to provide a field commander with enough information to make an informed decision about level of protection or

avoidance of an area. Obtaining this information will require that a representative number of IPCS units be analyzed quickly.

2.0 OBJECTIVES

The objectives for this study were:

- Demonstrate the ability of the IPCS to function in a battlefield environment. This included trying to access the IPCS' ability to absorb analytes of interest when contaminated with battlefield environmental chemicals as well as the ability of the IPCS to yield accurate results once contaminated with battlefield environmental chemicals;
- Determine how long the samplers will take to process, using the current state of technology. This is critical for a field commander to receive relevant information in a timely matter.
- Determine what environmental chemicals could be collected by the course of wear in the battlefield;

3.0 TEST STRATEGY

The strategy for this test was to deploy the samplers during live fire exercises being conducted by a Marine Corps Security Field Battalion at Fort A.P. Hill, Virginia. The samplers used were from W.L. Gore and SKC Corporation. These had been evaluated during an earlier study. The Gore samplers are composed of two small Tenax-containing packets (often referred to as pillows) inside a larger, permeable envelope. There are two designs from the SKC Corporation. The first, earlier SKC design incorporated a small, metal button that contained Tenax completely inside a plastic badge; this button is approximately 1 cm high by 1.5 cm wide, similar in size and appearance to a kitchen faucet water aerator. Analysis required that the plastic badge be broken into its component halves, and the Tenax-containing metal button removed and placed into a thermal desorber. In order to reduce sampling handling times, the second, later SKC design encased the Tenax directly inside the badge's plastic housing. Removal of the Tenax simply required removing the badge back and dumping the material directly into a thermal desorption tube.

A total of 40 of the Gore samplers were originally deployed, with 10 additional samplers sent to the field as controls. Of these 50, 15 were exposed prior to deployment to methyl salicylate

(MES), which is a common non-toxic chemical surrogate for HD. Five of the 15 pre-exposed samplers were to be used as field controls. These pre-exposed IPCS badges would have the amount of MES analyzed after battlefield exposure. This analysis would demonstrate how well the IPCS badges would retain the target analyte after field exposure; additionally, this would demonstrate what analytical interferents would be present from battlefield exposure.

Of the remaining 35, 10 would be exposed to MES after field deployment as a demonstration of how well the badges would retain target analytes after contaminated with battlefield chemicals.

The remaining 25 would be split into two groups. five would be sent to the field but not deployed to act as controls, and the remaining 20 would be analyzed to determine what kinds of materials were collected in the IPCS badges from the battlefield.

This plan is summarized in Table 3.1:

Table 3.1: Summary Of IPCS MES Exposure And Analysis

Sampler	Quantity	Purpose
Pre-Deployment MES Exposure	10	Demonstrate Ability to Retain Target Analytes During Field Conditions
Pre-Deployment MES Exposure	5	Not Deployed - Field Controls
Post-Deployment MES Exposure	10	Demonstrate Ability to Collect Target Analytes Once Contaminated with Battlefield Chemicals
No MES Exposure	20	Analyzed to Determine What Other Chemicals Are Absorbed
No MES Exposure	5	Not Deployed – Acts as Controls

3.1 Test Phase

3.1.1 MES Exposure Test Design

Dosing of the samplers was done with MES vapor. This was done to approximate field conditions. Dosing in this manner required that the samplers be exposed to a moving air stream of at least 20 linear feet per minute (20 LFPM).

Previous work using chamber exposure had been done using a carousel arrangement. Because this chamber had been used for nerve agent work, this carousel exposure chamber could not be used to expose samplers that were to be worn. Thus a new chamber was constructed. The primary design criteria for this chamber were:

- A 2 inch linear separation was to be maintained between the samplers;
- The chamber be capable of exposing between 15 and 20 samplers at a single time and;.
- A linear velocity of at least 20 SCFM be maintained in the chamber.

A simple rectangular frame rack held the samplers in place. The design of the samplers was such that a 4 inch wide frame would fulfill the 2 inch separation requirement readily. A 4 inch wide rectangular frame would also rest on the inner curvature of a 6 inch diameter cirde with sufficient clearance around all sides. Thus, using a single piece of standard 6 inch diameter pipe would allow the chamber to be constructed simply. The pipe chosen for this work was standard schedule 55 polyvinyl chloride (PVC) pipe. The pipe was capped using plastic female adapters and screw in plugs. Air flow was introduced into the chamber by drilling holes in the center of the end caps, tapping them, and then using 0.5 inch normal pipe thread adapters from Swagelock. A similar arrangement at the exhaust end of the chamber allowed the exhaust to be vented directly into a hood. Overall, the chamber was approximately 30 inches (76.2 cm) long with an inner diameter of 5.69 inches (14.45 cm). This corresponds to an internal volume of 12.5 liters. The rack occupied approximately 2/3 of this space, leaving the remaining space in the front of the chamber for mixing.

In order to achieve the required face velocity, it was necessary to achieve a flow rate that would sweep this volume in 0.125 minutes (7.5 seconds). This corresponds to a flow rate of 100 liters per minute. This flow was controlled by a Miller-Nelson instrument. The Miller-Nelson also regulated temperature and humidity in the flow to the chamber.

Adding vaporous MES to this air stream was done by diverting a low airflow from the output of the main stream through the headspace of a glass vial containing MES. This airflow was combined with the main airflow at the chamber head by means of a t-connector that pointed into

the main airflow. In practice, the MES air flow was set between 250 and 550 cubic centimeters per minute, as measured by a Buck Calibrator placed in-line from the air flow diversion point to the glass vial; once set, the air flow remained constant. In this configuration the chamber was run for several hours to determine the loss rate of MES gravimetrically, which would approximate the concentration of MES in the chamber. In addition, although efforts were made to minimize the presence of absorptive surfaces, running the chamber for several hours would saturate these surfaces and remove this source of error.

Under these conditions, the average measured loss rate for the MES at a flow of 523 cc/minute was 153 micrograms per minute (µg/min). This was measured five times over a period of 150 minutes. The standard deviation of these measurements was 15.7%, which was acceptable for approximation purposes. Thus, the MES concentration in the air stream moving pass the filters was 292 µg/L. This was diluted by a factor of 100 by the main air flow. Assuming that the Gore samplers diffuse 10 ml per minute at this face velocity, the samplers would be loaded at a rate of 29 nanograms per minute. Thus, an exposure of at least 5 minutes would load the samplers with about 150 nanograms of material, which was well above the projected minimum detection limit of the analytical method (although below the desired loading of 500 ng).

The pre-deployment exposure group of 15 Gore samplers were dosed with MES vapor just prior to being shipped to the field exercises. Dosing was done using two groups. The first group was composed of 10 samplers. When these samplers were exposed, four additional exposure control samplers were included on the rack so the MES loading could be checked. These exposure control samplers were located on the right and left front and rear of the rack. Similarly, when the remaining five samplers were dosed, two additional exposure control samplers were included, with one on the front and one on the rear of the rack. Finally, 8 of the new design SKC samplers (viz., Tenax absorbent integrated inside the badge) were exposed. A single WL Gore exposure control sampler was included with this final set.

After exposure, these samplers were repackaged and sent to the field. A Hobo H8 Pro data logger was also included to record temperature and relative humidity (RH) at 5-minute intervals. This data logger was maintained with the badges during field exposure, and allowed tracking of

the environment to which the samplers were exposed. The data logger was also used to verify the humidity and temperature conditions inside the chamber before challenging the samplers.

3.1.2 ANALYTICAL METHOD

Sample preparation of the IPCS units will be discussed in the **Results** section because of its importance in meeting one of the objectives of this study. All sample preparation activities were designed to put the sorbent or its contents into a tube so that thermal desorption could be done. Specifically, analysis of the samplers was done on an ATD-400 thermal desorber coupled to an Agilent 6890 GC/5973 MSD (this is equipped with a turbo pump, as required by the ATD). Conditions are summarized in Table 3.2.

Table 3.2: ATD-400/GC/MSD Conditions

Parameter	Value
Column	Restek RTX-5, 30 m x 0.25 mm i.d. Film thickness 0.25 micron
Gas Flow	24 psi; constant pressure mode
Temperature Program	40 ºC Hold 2 minutes Ramp 20 ºC/minute 250 ºC Hold 3 minutes
Mass Spectrometer	Electron Ionization, scanning between 45 and 350 amu

4.0 RESULTS

4.1 PRE-DEPLOYMENT ACTIVITIES

Analysis of the exposure controls samplers showed two unanticipated problems; namely, the amount of MES loaded on the samplers was far less than anticipated and there were notable differences between the samplers located on the front of the rack versus those on the rear. The amount of MES loaded on the first batch of samplers was on the order of 10 – 15 ng, and below detectable limits on the other batches. One probable reason for this was absorption of MES by the Tygon tubing used to take the airflow from the MES vial into the chamber. Tygon was selected because of its pliability, which was required to insure a leak-free fit around the glass

connection from the MES vial. The Tygon may have absorbed MES, despite preconditioning the exposure chamber with MES vapor prior to exposing the samplers.

The humidity in the chamber was lower than expected. The data logger showed the humidity to be between 10 percent and 15 percent, and may have gone to near zero on the second exposure batch due to a failure in the humidity control system. The effect of low humidity on the sampler's ability to absorb material is not known at this time.

The other notable result from the first batch was that the samplers located in the front of the rack contained approximately 30 percent more MES than those located in the rack rear. This could indicate changes in the chamber flow pattern as the gas approaches the chamber exit. This chamber will not be used again due to its poor performance compared to the carousel.

4.2 ENVIRONMENTAL CONDITIONS DURING THE FIELD EXERCISE

The output from the data logger is shown in Figure 4.2.1 and 4.2.2 (raw data is presented in Appenix A). Figure 4.2.1 displays the temperature while Figure 4.2.2 displays relative humidity (RH). As indicated in the instructions included with the Hobo, a wet sensor causes the RH to be read at or above 100%. This is seen during several periods. During the exercise there was rain at the beginning and the other 100% RH periods are assumed to be caused by dew forming on the instrument. In summary, the field exercises did not occur during a period of high temperature, although the atmosphere was wet.

4.3 Post-Deployment Activities

The deployment of the samplers did not go as planned. Approval for the wearing of MES-containing badge tests using human subjects was not obtained in time for the field exercises. Instead, the pre-exposed badges were hung in the field exercises area along with the Hobo data logger.

In addition, recovery of the badges from the field was also poor. Other than the controls, 7 of the Gore samplers and 7 of the old design SKC samplers were returned.

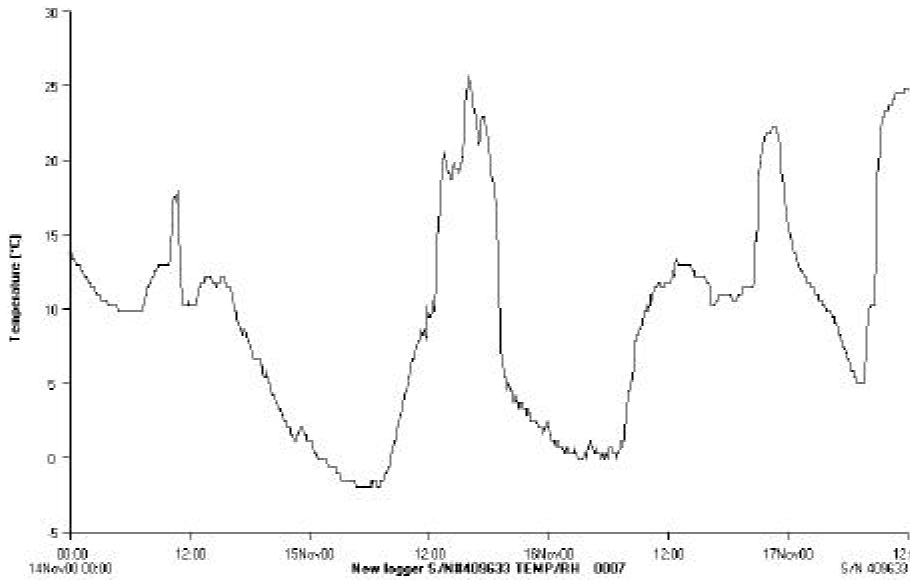

Figure 4.2.1 – Temperature (ºC) Recorded Between Midnight 11/14 and Noon 12/17

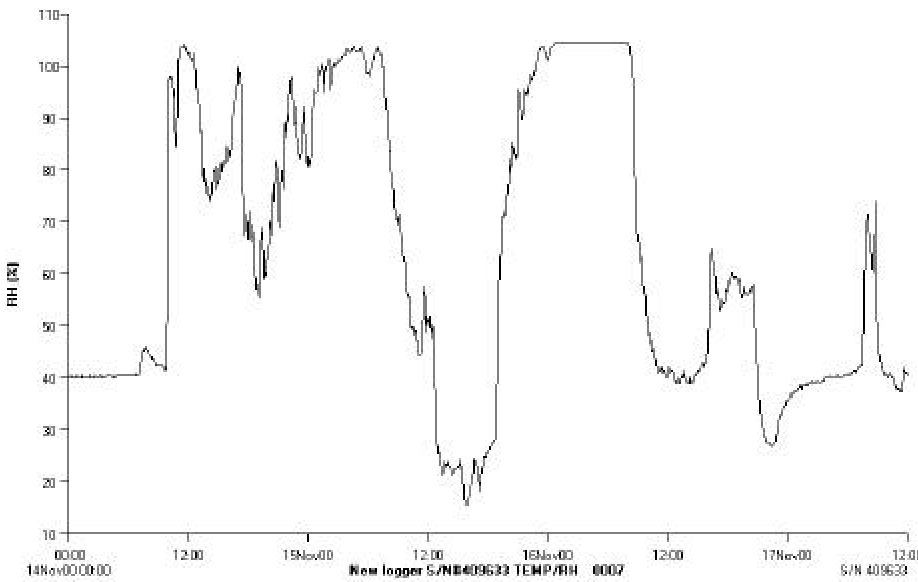

Figure 4.2.2 – Relative Humidity (%) Recorded Between Midnight 11/14 and Noon 12/17

Of these, only three complete sets were obtained (that is, both the Gore and the SKC sampler were returned from the soldier who wore both of them throughout the exercise). In order to glean as much useful information as possible from this, an analysis strategy was adopted that is detailed in Table 4.2.1.

Table 4.2.1 – Post Deployment Exposure And Analysis

Sampler Group	Count	Disposition
Pre-exposed Samplers with Measurable MES	9	Analyze Without Further MES Exposure
Field Blanks	5	Analyze Without Further MES Exposure
Worn Gore (One with Matching SKC)	4	Analyze Without Further MES Exposure
Worn SKC (One with Matching Gore)	4	Analyze Without Further MES Exposure
New Style SKC	4	Analyze Without Further MES Exposure
Worn Gore (Two with matching SKC)	3	Post Expose to MES and Analyze
Worn SKC (Two with Matching Gore)	3	Post Expose to MES and Analyze
New Style SKC	4	Post Expose to MES and Analyze

4.4 Sample Preparation

One of the goals of this study was to try and gauge the amount of time required to prepare and process these samples. As such, sample preparation of the two types of samplers will be discussed, followed by a discussion of the general analytical requirements. Both types of samplers eventually lead to the same analysis instrument and method, so differences in time requirements would apply to sample work-up and post-analysis clean up.

4.4.1 Gore samplers: With one exception, the Gore external packets were returned without damage, although several were mildly soiled. The one exception was that one sampler was torn or had separated along the edge where the backing meets the front.

The samplers were individually opened and the pillows removed. All of the pillows appeared to be undamaged, and there was no apparent staining, condensation, or other unusual features. One of the two pillows was placed inside an individually numbered metal PE/ATD desorber tube. The pillow was inserted into the tube end by hand and pushed to the approximate mid-

point of the tube by means of a glass Pasteur pipette. The second pillow was retained, along with the original packet, for possible further use.

4.4.2 SKC Samplers: Both the old design and new design SKC samplers were used. The Marines wore the older style, which contained the sorbent within a small metal button inside the badge housing. As noted earlier, this metal button had to be removed from the badge for separate thermal desorption. Removing the metal button required that the badge be broken down into its component halves. Once the button was removed, it was placed into a TDsorb™ instrument. The TDSorb heated the button to about 160 C while gas flowed through it and then channeled the exhaust into the Tenax tube. Desorption was continued for 10 minutes.

As noted previously, the newer style SKC badge incorporates the sorbent directly into the badge structure. Analysis of this new design SKC requires that the sorbent be removed from the badge and directly packed into a thermal desorption tube. This process was greatly facilitated by the badge design. The badge was easily disassembled, and the transfer of the sorbent was easily done due to the funnel design of the rear of the badge, the stem of which neatly fitted into a metal thermal desorption tube. Unfortunately, the amount of sorbent packed into the badges exceeded the capacity of the metal thermal desorption tubes by about 25 percent. Because the SKC and Gore are a passive absorption badge, the assumption cannot be made that any target analytes have been absorbed uniformly on the badge contents. Therefore it is necessary to desorb the entire Tenax contents of the badge.

This issue was examined further. These 8 badges were hand-packed prototypes. A second set of SKC badges were received after the field exercise was concluded. The Tenax contents of this new lot of badges were compared to the contents of the first 8 badges by weight and volume. It was found that the contents of the first lot of badges filled the thermal desorption tube to within a few millimeters of the tube top, while the contents of the new lot left several centimeters of space. This latter configuration is preferred. The weight of Tenax packed into the first badge lot was found to be about 23 percent higher than what was found in the new lot. This indicates that it was a manufacturing issue and not one of particle mesh. The problem appears to be solved.

4.5 TIME REQUIRED FOR ANALYSIS

The Table 4.5.1 summarizes the times required for analysis of a single batch. Overall, this is presented graphically in Figure 4.5.1. There are two caveats to consider when evaluating this data; namely, that this is based on the technology currently in use and that several of these tasks may be done concurrently. More specifically, instrument usage is based on the ATD-400. This instrument must be loaded completely before operation can begin. Newer technology or technology from a different vendor may permit samples to be added and removed during the course of a run; in other words, the operation is effectively pipelined. In addition, this overall time-line is based on one person doing all operations. A team approach will, of course, reduce the time required, although the labor time will remain the same.

Table 4.5.1 – Summary Of Analysis Times

Activity	Description	Time
Prepare Standards	Inject solution containing standards into Tenax tube; remove solvent through drawing air through the tube.	60 minutes (Does not include solution preparation)
Prepare Samples	Gore: Open badge, remove pillow, insert pillow in thermal desorption tube, log	3 minutes/badge
	SKC – Old design – Open badge, remove sorbent button, thermally desorb, log	15 minutes/badge
	SKC – New design – Open badge, remove sorbent and place inside thermal desorption tube, log	3 minutes/badge
Instrument Preparation	Load samples into thermal desorption unit, enter data into program.	60 minutes/batch
Analysis time per sample	Thermal desorption, chromatographic analysis, GC thermal recycle	28 minutes/badge
Post Analysis Data Evaluation	For a detailed analysis, including examination of the chromatograms.	180 minutes/batch
Clean-up	Remove pillows; thermally condition and clean the thermal desorption tubes.	120 minutes/batch

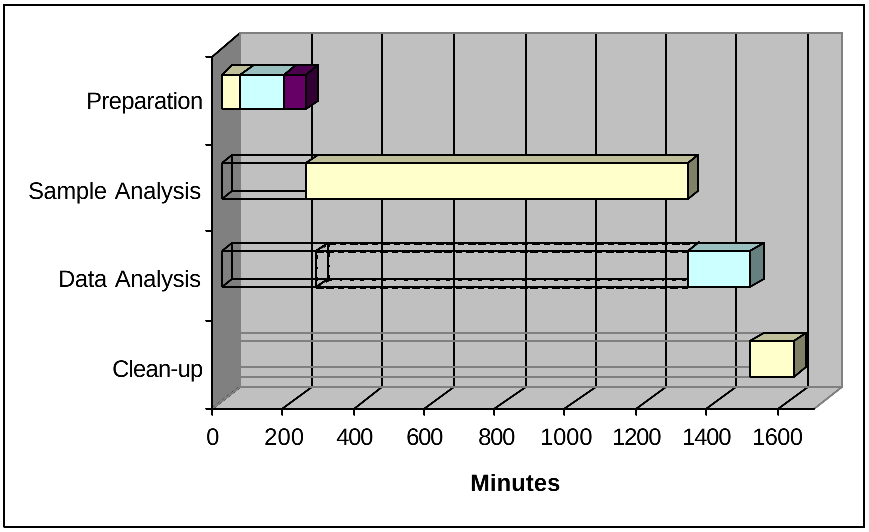

FIGURE 4.5.1 – GRAPHICAL REPRESENTATION OF ANALYSIS TIME REQUIREMENTS

4.6 ANALYSIS RESULTS

4.6.1 BADGES EXPOSED TO MES PRIOR TO DEPLOYMENT

Nine of the Gore badges were analyzed for MES; the SKC badges used for the pre-exposure work were of new style construction and were not analyzed because of the problems with the amount of sorbent. The results are summarized in Table 4.6.1.1:

Table 4.6.1.1 – Summary of Analysis of Predeployment MES Exposure

Badge Numbers	MES contents (nanograms, ng)
WLG001, 002, 003, 004, 006, 009	< 5 ng
WLG 005	7 ng
WLG007, 008	6 ng

MES recovery on these samplers is very low, but is consistent with the low pre-exposure sampler loading. It is doubtful that this was due to some kind of discrimination during MES exposure. The samplers were located on different parts of the rack; WLG005 was on the left rear of the rack, while WLG007 and WLG008 were in the middle of the left side. One of the field blanks - WLG035 – contained 6 ng of MES, although this sampler was not intentionally exposed to MES.

The chromatograms and mass spectra for these samplers were examined on a later date for the presence of benzene, tertrachloroethene, ethylbenzene, limonene and undecane. Undecane was present in these samplers; there was no limonene identified in these samples. The remaining compounds were not seen in the chromatogram, although it must be noted that the search for these compounds was added later in the test. The GC analytical conditions were not optimized for these new compounds when these were analyzed, so they may not of been seen.

The chromatograms for most of these samplers contained a large number of peaks. An example chromatogram for a SKC sampler is shown as Figure 4.6.1.1, while a Gore sampler is shown in Figure 4.6.1.2. These are, respectively, SKC278 and WL Gore 278, which were worn by the same soldier throughout the field exercise. A preliminary assessment indicates that the peaks in the later part of the chromatogram are similar for all samplers, including the field blanks (a similar chromatogram of a field blank is shown in Figure 4.6.3). This strongly suggests that these components in the chromatogram represent the badge chemical background and/or site background from the exercise.

4.6.2 BADGES DEPLOYED BUT NOT MES EXPOSED

These included the field blanks as well as several that were worn by soldiers. These included both the Gore samplers and SKC samplers. Example chromatograms of the Gore and SKC samplers are included as Figure 4.6.2.1 and 4.6.2.2 respectively. These samplers are Gore049 and SKC049 which were both worn throughout the exercise by the same soldier. The chromatograms have areas of major differences, with the Gore sampler chromatogram containing many more peaks. A summary of these results is shown in Table 4.6.2.1.
With one exception, there are no unusual results. These results suggest that the MES analytical error close to the detection limit is relatively large. Thus, it is possible that the low-levels of MES found on several of the pre-deployment exposed samplers were, in fact, below the detection limit. The unusual result in this category, of course, is WLG028. This sampler should not of contained any MES. There is no explanation for this that has been found

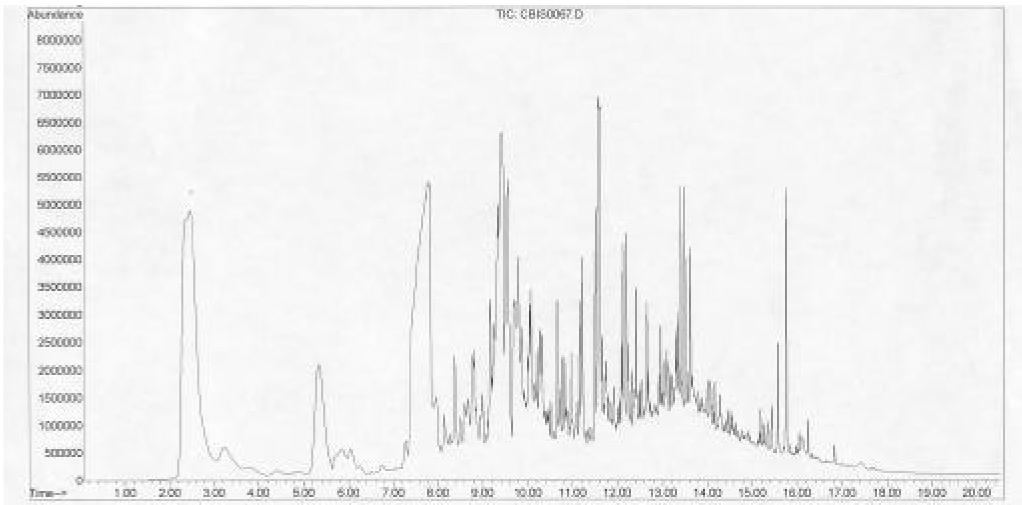

Figure 4.6.1.1 – Chromatogram of SKC Sampler 278

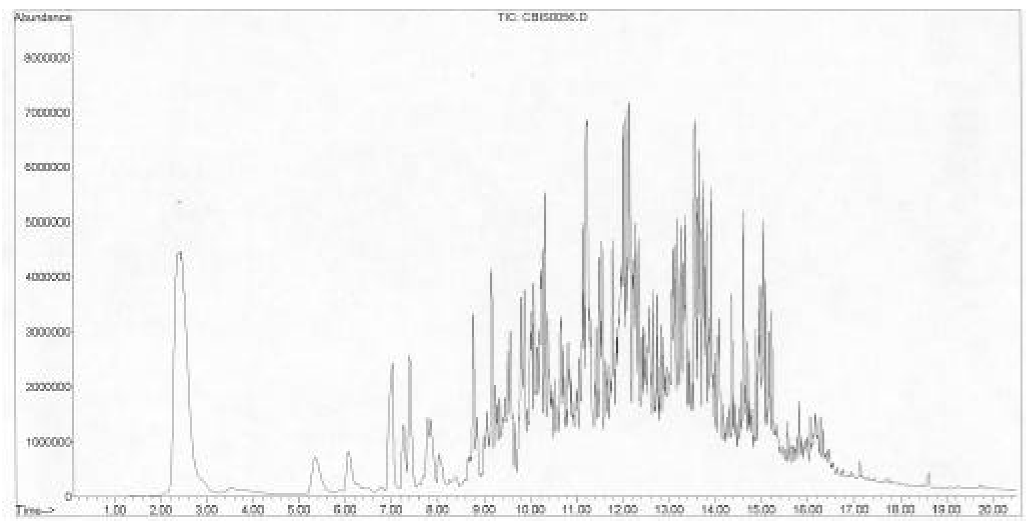

Figure 4.6.1.2 – Chromatogram of Gore Sampler 278

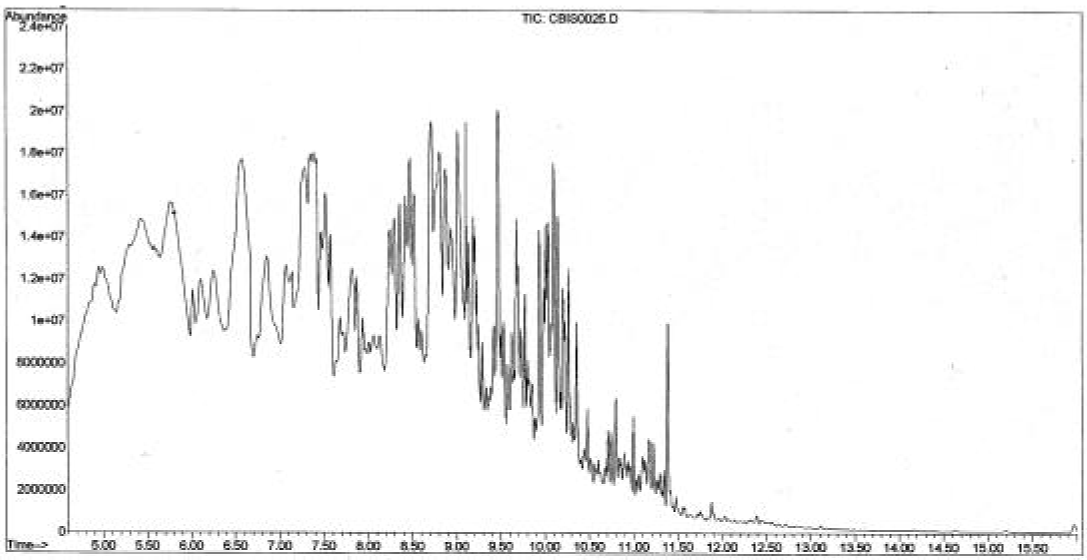

Figure 4.6.2.1 – Chromatogram of Gore Sampler 049

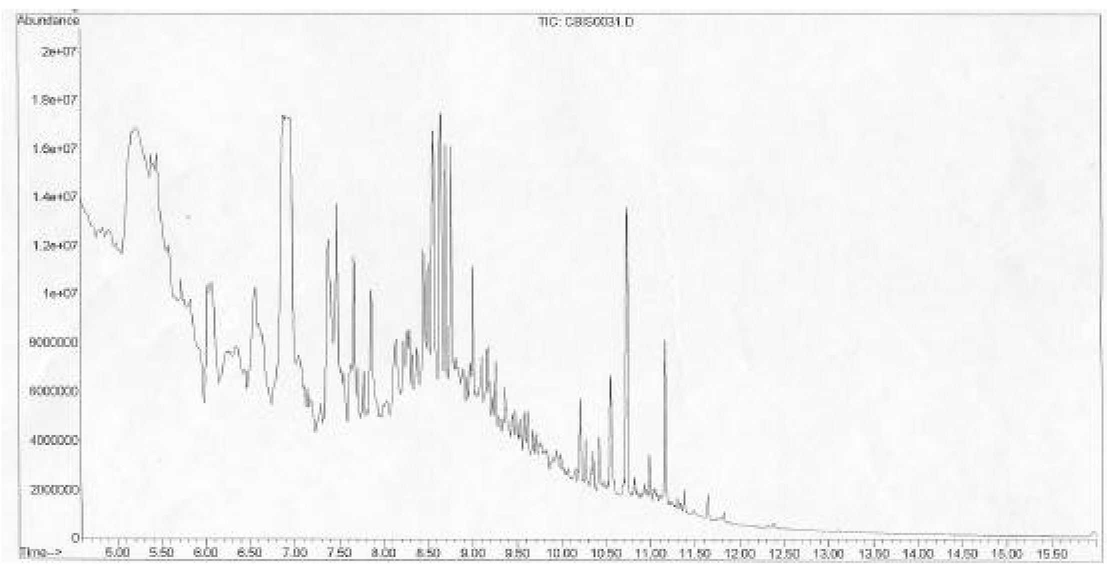

Figure 4.6.2.2 – Chromatogram of SKC Sampler 049

TABLE 4.6.2.1 – Summary of MES Content of Deployed But Not Exposed Samplers

Sampler Identification	Use	MES Content (Nanograms)
WLG031	Field Blank	< 5
WLG032	Field Blank	< 5
WLG033	Field Blank	5
WLG034	Field Blank	< 5
WLG035	Field Blank	6
WLG021	Deployed	< 5
WLG028	Deployed	37 (estimated; exceeds calibration curve)
WLG049	Deployed	< 5
WLG050	Deployed	< 5
SKC019	Deployed	< 5
SKC037	Deployed	< 5
SKC038	Deployed	< 5
SKC049	Deployed	< 5
Transportation Blank	Blank from Preparation to Analysis	< 5

4.6.3 Badges Exposed to MES After Deployment

Three of the field deployed Gore and four of the field deployed SKC badges were exposed to MES after return as a gauge of how well these badges would function after being in a combat environment. In addition, several modifications were made to the analysis to increase the information obtained. This included identifying several of the larger chromatogram peaks and quantifying benzene, tetrachloroethene, ethyl benzene, limonene, undecane and MES; additionally, the presence or absence of trimethylbenzene in each sampler was confirmed. The presence of these compounds would suggest that the badges were collecting vehicle exhaust, weapons exhaust, or weapons-cleaning solvent or oil.

The line that lead from the MES bubbler to the chamber was changed to one made from a Teflon material, which does not absorb MES. In the same manner as before, the chamber was run for at least an hour before any samples were exposed, and the amount of MES entering the gas phase over this period determined gravimetrically. In this instance, the gas flow through the MES source was set to 270 cc/min as measured by the flow calibrator, which was lower than the gas flow used during the first exposure. Gravimetric data indicated that MES was being lost at a

rate 67 µg/minute. This indicates a 67 ng/L concentration in the chamber flow. Using the SKC diffusion rate as a model, which is10 mL/minute, the mass being transported into the samplers would be about 6.7 ng per minute (the Gore samplers diffuse at 40 mL/min). Therefore to get 100 ng of MES loaded into the samplers, they would have to be exposed for at least 15 minutes.

Exposure was done on the same rack as before. Three additional Gore samplers were included to confirm how much material would be absorbed by a pristine sampler. In addition, one other Gore sampler (WLG054) traveled with the samples during the course of the experiment but was not exposed; this was called the lab blank. WLG056 was a transportation blank between the sample preparation area and the ATD instrument; this was thermally cycled before an actual analysis was performed. Results of the MES exposure on this sample set is shown in Table 4.6.3.1.

Table 4.6.3.1: MES Found On Samplers Exposed After Field Deployment

Sampler	Use	Nanograms MES found
WLG051	Chamber Dosing Check	51.72
WLG055	Chamber Dosing Check	52.07
WLG278	Field Deployed	37.01
SKC278	Field Deployed	18.14
WLG279	Field Deployed	29.77
SKC279	Field Deployed	19.47
WLG037	Field Deployed	31.46
SKC048	Field Deployed	15.09
WLG053	Chamber Dosing Check	45.84
WLG054	Laboratory Blank	1.99

The badges numbered 278 and 279 constitute two sets where both the Gore and SKC samplers were returned from the same soldier.

Although the population in this case is too small to treat statistically, there are trends that are apparent. First of all, WLG051 and 055 were located on the rack front. Although the MES loading was lower than desired, there is excellent agreement between the two. WLG053 was located on the rear of the rack and shows some of the same mass discrimination as seen before, but the amount of MES is still significant (within 10 percent of the front samplers). In

comparing these badges to the field deployed Gore badges, it is apparent that the field-deployed badges are not as efficient absorbing MES. The results also suggest that the Gore badges are also more efficient than the SKC badges, which agrees with earlier testing where higher sampling flow rates were found with the Gore samplers.

4.6.4 IPCS Concentrations of Benzene, Tetrachloroethene, Ethylbenzene, Limonene, Undecane and TMB

The concentrations of Benzene, Tetrachloroethene, Ethylbenzene, Limonene, Undecane and trimethylbenzene (TMB) were quantified. Results, in nanograms, are shown in Table 4.6.4.1.

Table 4.6.4.1 – Concentrations, in Nanograms, of Various Organics on Samplers

Sampler	Use	Benzene	Tetrachloro-ethene	Ethyl-Benzene	Limonene	Undecane	Trimethyl-benzene
WLG051	Exp. Chk.	0.30	0.54	0.41	2.58	12.95	Yes
WLG055	Exp. Chk.	0.36	0.29	0.36	1.16	3.60	Yes
WLG278	Worn	1.18	4.07	9.66	14.97	7.10	Yes
SKC278	Worn	6.36	4.75	5.12	6.00	8.25	Yes
WLG279	Worn	7.62	3.05	25.86	17.30	22.29	Yes
SKC279	Worn	36.67	3.77	12.29	6.76	9.96	Yes
WLG037	Worn	0.87	2.27	5.37	17.64	10.08	Yes
SKC048	Worn	8.25	5.90	7.58	10.73	7.18	Yes
WLG053	Exp. Chk.	0.54	6.31	2.46	24.59	5.63	Yes
WLG054	Lab Blank	0.36	0.36	0.32	1.21	10.22	Yes

Exp. Chk. = Exposure Check

It should be emphasized that the small number of recovered samplers make drawing conclusions subject to large error. Many of the same trends are apparent here as with the MES samples. Again, the samplers are not consistent, even when worn by the same soldier. What is noteworthy is that the differences are proportionally the same for the aromatic compounds. Specifically, the level of benzene in WLG278 is 1.18 ng, while in SKC 278 it is 6.36, or approximately a factor of 5. In WLG 279 and SKC 279, the amounts are 7.62 ng and 36.67 ng respectively – again, approximately a factor of 5 between the two. Similar results are found for ethyl benzene where the results differ by a factor of about 2, although here the Gore samplers contain more material.

This is repeated again for limonene, where a factor of about 2.5 is present between the Gore and SKC samplers, although the Gore samplers have more absorbed limonene. This suggests that while the samplers use the same absorbent and have differing responses to a given concentrations, the ratio of the components in badges are similar.

4.6.5 Other Materials Found

One other chromatogram peak was identified due to its comparatively high concentration, as evidenced by the broad peak. In the SKC samplers N,N-dimethylacetamide, a volatile organic solvent, was identified. The source of this material is not known. The N, N-dimethylacetamide is not thought to be from a battlefield source and it is not used in the facility where the analysis took place. Most likely it is remaining from the badge manufacturing process,

5.0 CONCLUSIONS

The small number of samples returned from the field plus the redesign process that these samplers are going through limits the judgements that can be made. Nevertheless, the data suggests several questions and conclusions that have to examined further.

- The IPCS units are absorbing atmospheric contaminants as well as target analytes, and the samplers themselves may have a significant background. This can be dealt with analytically when the substances being looked for are known beforehand; however, looking for unknowns may be difficult or impossible to find. It should also be noted that these samplers are typically intended for an 8-hour exposure time, and this test was several times that exposure period.
- The amount of MES retained on the samplers or absorbed by the samplers once placed in the environment is possibly lower than an equivalent, unexposed sampler. This may have significant implications when these samplers are deployed for relatively long periods that could be on the order of several days to several weeks.
- There is a possible significant absorption difference between the two designs, SKC and Gore, used in this work. The cause of this is not known, although orientation relative to a contaminant flow stream may be part of it.

- The samplers themselves are relatively easy to prepare for analysis, and their regular shape implies that automation may also be employable. Nevertheless, the main time factor will continue to be the actual analysis time. This also may be reduced through the use of a different analytical technique that does not rely on chromatography.
- The SKC application to IPCS is not as straightforward as the Gore application; with the SKC redesign this is changing.

APPENDIX A

RAW DATA FROM HOBO DATA LOGGER

Date + Time	Temperature (º F)	Relative Humid. %
11/14/00 7:59	52.49	45.5
11/14/00 8:04	53.19	45
11/14/00 8:09	53.19	45
11/14/00 8:14	53.19	45
11/14/00 8:19	53.89	44.5
11/14/00 8:24	53.89	44
11/14/00 8:29	53.89	44
11/14/00 8:34	54.58	43.5
11/14/00 8:39	54.58	43.5
11/14/00 8:44	54.58	43.5
11/14/00 8:49	54.58	42.9
11/14/00 8:54	54.58	42.4
11/14/00 8:59	55.28	42.4
11/14/00 9:04	55.28	42.4
11/14/00 9:09	55.28	42.4
11/14/00 9:14	55.28	42.4
11/14/00 9:19	55.28	42.4
11/14/00 9:24	55.28	42.4
11/14/00 9:29	55.28	42.4
11/14/00 9:34	55.28	42.4
11/14/00 9:39	55.28	41.9
11/14/00 9:44	55.28	41.9
11/14/00 9:49	55.28	41.4
11/14/00 9:54	55.28	41.9
11/14/00 9:59	55.28	41.4
11/14/00 10:04	55.97	59.5
11/14/00 10:09	56.66	93.2
11/14/00 10:14	57.35	96.6
11/14/00 10:19	60.11	97.7
11/14/00 10:24	60.11	97.7
11/14/00 10:29	62.85	97.3
11/14/00 10:34	63.54	97.3
11/14/00 10:39	62.85	93.9
11/14/00 10:44	63.54	95.1
11/14/00 10:49	63.54	89
11/14/00 10:54	64.22	84.7
11/14/00 10:59	58.73	84.2
11/14/00 11:04	56.66	95.9
11/14/00 11:09	55.28	100.1
11/14/00 11:14	53.19	102
11/14/00 11:19	51.79	102.9
11/14/00 11:24	51.08	103.2
11/14/00 11:29	50.38	103.2
11/14/00 11:34	50.38	103.5
11/14/00 11:39	50.38	103.2

Date + Time	Temperature (º F)	Relative Humid. %
11/14/00 11:44	50.38	103.8
11/14/00 11:49	50.38	103.5
11/14/00 11:54	50.38	103.2
11/14/00 11:59	51.08	102.3
11/14/00 12:04	50.38	101.7
11/14/00 12:09	50.38	102.3
11/14/00 12:14	50.38	102.3
11/14/00 12:19	50.38	101.7
11/14/00 12:24	50.38	101.4
11/14/00 12:29	50.38	100.8
11/14/00 12:34	50.38	100.8
11/14/00 12:39	50.38	102
11/14/00 12:44	51.08	100.1
11/14/00 12:49	51.08	99.4
11/14/00 12:54	51.79	99.1
11/14/00 12:59	51.79	96.6
11/14/00 13:04	52.49	93.9
11/14/00 13:09	52.49	93.2
11/14/00 13:14	52.49	91.9
11/14/00 13:19	53.19	88.6
11/14/00 13:24	53.19	86.9
11/14/00 13:29	53.19	87.3
11/14/00 13:34	53.89	81.5
11/14/00 13:39	53.19	78.6
11/14/00 13:44	53.89	80
11/14/00 13:49	53.89	75.2
11/14/00 13:54	53.89	78.1
11/14/00 13:59	53.89	77.2
11/14/00 14:04	53.89	76.2
11/14/00 14:09	53.89	74.8
11/14/00 14:14	53.19	74.8
11/14/00 14:19	53.19	74.8
11/14/00 14:24	53.19	73.8
11/14/00 14:29	53.19	76.2
11/14/00 14:34	53.19	79.1
11/14/00 14:39	53.19	79.6
11/14/00 14:44	52.49	79.6
11/14/00 14:49	52.49	80.5
11/14/00 14:54	53.19	80.5
11/14/00 14:59	53.19	76.2
11/14/00 15:04	53.19	77.7
11/14/00 15:09	53.19	77.2
11/14/00 15:14	53.89	79.1
11/14/00 15:19	53.89	81
11/14/00 15:24	53.89	78.1

Date + Time	Temperature (º F)	Relative Humid. %
11/14/00 15:29	53.89	81
11/14/00 15:34	53.89	81
11/14/00 15:39	53.19	81.5
11/14/00 15:44	53.19	80.5
11/14/00 15:49	52.49	81.5
11/14/00 15:54	52.49	84.2
11/14/00 15:59	52.49	84.2
11/14/00 16:04	52.49	84.2
11/14/00 16:09	52.49	82.4
11/14/00 16:14	52.49	81.5
11/14/00 16:19	51.79	83.3
11/14/00 16:24	51.08	84.2
11/14/00 16:29	51.08	89
11/14/00 16:34	50.38	89.5
11/14/00 16:39	49.67	91.1
11/14/00 16:44	49.67	92.4
11/14/00 16:49	48.96	91.9
11/14/00 16:54	48.25	94.3
11/14/00 16:59	48.25	95.1
11/14/00 17:04	47.53	97.3
11/14/00 17:09	47.53	99.4
11/14/00 17:14	47.53	97.7
11/14/00 17:19	46.82	98.4
11/14/00 17:24	46.82	94.3
11/14/00 17:29	47.53	86
11/14/00 17:34	47.53	77.7
11/14/00 17:39	47.53	72.3
11/14/00 17:44	46.82	70.3
11/14/00 17:49	46.82	67.2
11/14/00 17:54	46.1	68.8
11/14/00 17:59	46.1	71.3
11/14/00 18:04	45.38	68.8
11/14/00 18:09	45.38	66.7
11/14/00 18:14	45.38	66.7
11/14/00 18:19	44.65	71.8
11/14/00 18:24	44.65	70.3
11/14/00 18:29	43.92	68.8
11/14/00 18:34	43.92	66.2
11/14/00 18:39	43.92	67.8
11/14/00 18:44	43.92	65.2
11/14/00 18:49	43.92	62.1
11/14/00 18:54	43.92	56.9
11/14/00 18:59	43.92	58
11/14/00 19:04	43.92	58
11/14/00 19:09	43.92	56.4

Date + Time	Temperature (º F)	Relative Humid. %
11/14/00 19:14	43.19	55.4
11/14/00 19:19	43.19	58.5
11/14/00 19:24	42.46	64.2
11/14/00 19:29	41.72	68.8
11/14/00 19:34	41.72	67.2
11/14/00 19:39	41.72	62.1
11/14/00 19:44	42.46	59
11/14/00 19:49	41.72	60.1
11/14/00 19:54	41.72	59.5
11/14/00 19:59	41.72	62.6
11/14/00 20:04	40.97	62.6
11/14/00 20:09	40.97	64.2
11/14/00 20:14	40.23	66.7
11/14/00 20:19	40.23	69.8
11/14/00 20:24	39.48	69.8
11/14/00 20:29	39.48	67.2
11/14/00 20:34	39.48	70.8
11/14/00 20:39	39.48	75.2
11/14/00 20:44	38.72	73.8
11/14/00 20:49	38.72	81
11/14/00 20:54	37.97	81
11/14/00 20:59	37.97	81.5
11/14/00 21:04	37.97	79.1
11/14/00 21:09	37.97	70.8
11/14/00 21:14	37.2	68.8
11/14/00 21:19	37.2	69.3
11/14/00 21:24	37.2	75.7
11/14/00 21:29	36.43	79.6
11/14/00 21:34	36.43	76.2
11/14/00 21:39	36.43	84.7
11/14/00 21:44	36.43	88.6
11/14/00 21:49	36.43	88.6
11/14/00 21:54	35.66	86
11/14/00 21:59	35.66	88.2
11/14/00 22:04	35.66	90.3
11/14/00 22:09	35.66	89
11/14/00 22:14	34.88	92.8
11/14/00 22:19	34.88	96.2
11/14/00 22:24	34.88	97.7
11/14/00 22:29	34.1	97
11/14/00 22:34	34.1	95.9
11/14/00 22:39	34.1	90.7
11/14/00 22:44	34.1	88.2
11/14/00 22:49	34.1	89.5
11/14/00 22:54	34.88	91.9

Date + Time	Temperature (º F)	Relative Humid. %
11/14/00 22:59	34.88	86.4
11/14/00 23:04	35.66	85.6
11/14/00 23:09	35.66	83.3
11/14/00 23:14	35.66	83.8
11/14/00 23:19	35.66	81.9
11/14/00 23:24	35.66	84.2
11/14/00 23:29	35.66	86.9
11/14/00 23:34	34.88	87.8
11/14/00 23:39	34.88	89.9
11/14/00 23:44	34.88	91.9
11/14/00 23:49	34.1	88.2
11/14/00 23:54	34.1	85.1
11/14/00 23:59	34.1	81
11/15/00 0:04	34.1	82.4
11/15/00 0:09	34.1	80.5
11/15/00 0:14	34.1	81.5
11/15/00 0:19	34.1	80.5
11/15/00 0:24	33.31	83.8
11/15/00 0:29	33.31	87.8
11/15/00 0:34	32.52	90.3
11/15/00 0:39	32.52	93.5
11/15/00 0:44	32.52	95.1
11/15/00 0:49	32.52	95.1
11/15/00 0:54	31.72	94.7
11/15/00 0:59	31.72	95.1
11/15/00 1:04	31.72	97.7
11/15/00 1:09	31.72	99.4
11/15/00 1:14	31.72	98.7
11/15/00 1:19	31.72	98
11/15/00 1:24	31.72	98
11/15/00 1:29	31.72	99.4
11/15/00 1:34	31.72	100.1
11/15/00 1:39	31.72	98.4
11/15/00 1:44	31.72	94.7
11/15/00 1:49	31.72	98
11/15/00 1:54	30.91	99.8
11/15/00 1:59	30.91	100.1
11/15/00 2:04	30.91	100.1
11/15/00 2:09	30.91	101.1
11/15/00 2:14	30.91	101.1
11/15/00 2:19	30.91	97.3
11/15/00 2:24	30.91	95.1
11/15/00 2:29	30.91	97.3
11/15/00 2:34	30.91	99.8
11/15/00 2:39	30.91	100.1

Date + Time	Temperature (º F)	Relative Humid. %
11/15/00 2:44	30.1	99.8
11/15/00 2:49	30.1	99.8
11/15/00 2:54	30.1	100.1
11/15/00 2:59	30.1	100.4
11/15/00 3:04	30.1	100.1
11/15/00 3:09	30.1	101.1
11/15/00 3:14	29.28	100.8
11/15/00 3:19	29.28	100.8
11/15/00 3:24	29.28	100.8
11/15/00 3:29	29.28	101.4
11/15/00 3:34	29.28	101.7
11/15/00 3:39	29.28	101.7
11/15/00 3:44	29.28	102
11/15/00 3:49	29.28	101.7
11/15/00 3:54	29.28	102
11/15/00 3:59	29.28	102.9
11/15/00 4:04	29.28	102.9
11/15/00 4:09	29.28	102.6
11/15/00 4:14	29.28	102.3
11/15/00 4:19	29.28	102.6
11/15/00 4:24	29.28	102.6
11/15/00 4:29	29.28	102.9
11/15/00 4:34	29.28	103.2
11/15/00 4:39	29.28	103.5
11/15/00 4:44	28.45	103.2
11/15/00 4:49	28.45	102.6
11/15/00 4:54	28.45	102.6
11/15/00 4:59	28.45	102.6
11/15/00 5:04	28.45	102.6
11/15/00 5:09	28.45	102.6
11/15/00 5:14	28.45	102.6
11/15/00 5:19	28.45	102.9
11/15/00 5:24	28.45	103.2
11/15/00 5:29	28.45	103.2
11/15/00 5:34	28.45	102.6
11/15/00 5:39	28.45	102
11/15/00 5:44	28.45	101.7
11/15/00 5:49	28.45	100.4
11/15/00 5:54	28.45	98.4
11/15/00 5:59	28.45	98.4
11/15/00 6:04	28.45	98.4
11/15/00 6:09	28.45	98
11/15/00 6:14	29.28	97.7
11/15/00 6:19	29.28	98.7
11/15/00 6:24	28.45	99.8

Date + Time	Temperature (º F)	Relative Humid. %
11/15/00 6:29	29.28	99.4
11/15/00 6:34	29.28	100.1
11/15/00 6:39	29.28	101.4
11/15/00 6:44	29.28	101.1
11/15/00 6:49	29.28	102
11/15/00 6:54	28.45	102.6
11/15/00 6:59	28.45	102.9
11/15/00 7:04	28.45	103.2
11/15/00 7:09	29.28	102.9
11/15/00 7:14	29.28	102.3
11/15/00 7:19	29.28	101.7
11/15/00 7:24	29.28	102
11/15/00 7:29	29.28	100.1
11/15/00 7:34	29.28	99.4
11/15/00 7:39	30.1	99.8
11/15/00 7:44	30.1	98.4
11/15/00 7:49	30.1	94.7
11/15/00 7:54	30.91	92.4
11/15/00 7:59	30.91	90.7
11/15/00 8:04	30.91	88.6
11/15/00 8:09	31.72	87.8
11/15/00 8:14	32.52	83.3
11/15/00 8:19	32.52	83.3
11/15/00 8:24	32.52	81
11/15/00 8:29	33.31	78.1
11/15/00 8:34	34.1	76.7
11/15/00 8:39	34.1	75.7
11/15/00 8:44	34.88	73.3
11/15/00 8:49	35.66	71.3
11/15/00 8:54	35.66	70.3
11/15/00 8:59	36.43	70.8
11/15/00 9:04	36.43	69.3
11/15/00 9:09	37.2	70.3
11/15/00 9:14	37.2	71.3
11/15/00 9:19	37.97	69.8
11/15/00 9:24	37.97	69.3
11/15/00 9:29	38.72	66.7
11/15/00 9:34	39.48	63.7
11/15/00 9:39	40.23	62.6
11/15/00 9:44	40.23	62.6
11/15/00 9:49	40.23	61.6
11/15/00 9:54	40.97	60.6
11/15/00 9:59	41.72	57.5
11/15/00 10:04	41.72	55.4
11/15/00 10:09	42.46	55.9

Date + Time	Temperature (º F)	Relative Humid. %
11/15/00 10:14	43.19	55.4
11/15/00 10:19	43.19	53.3
11/15/00 10:24	43.92	49.7
11/15/00 10:29	43.92	49.7
11/15/00 10:34	43.92	49.1
11/15/00 10:39	44.65	48.1
11/15/00 10:44	45.38	49.7
11/15/00 10:49	45.38	48.6
11/15/00 10:54	46.1	49.1
11/15/00 10:59	46.1	47.1
11/15/00 11:04	46.1	47.1
11/15/00 11:09	46.1	44.5
11/15/00 11:14	47.53	44.5
11/15/00 11:19	46.82	44.5
11/15/00 11:24	46.82	45
11/15/00 11:29	47.53	46
11/15/00 11:34	46.82	56.4
11/15/00 11:39	47.53	55.4
11/15/00 11:44	46.1	57.5
11/15/00 11:49	46.82	54.3
11/15/00 11:54	50.38	48.6
11/15/00 11:59	48.96	51.7
11/15/00 12:04	48.96	51.2
11/15/00 12:09	48.96	50.2
11/15/00 12:14	48.96	51.2
11/15/00 12:19	49.67	51.7
11/15/00 12:24	51.08	47.6
11/15/00 12:29	49.67	50.2
11/15/00 12:34	49.67	50.2
11/15/00 12:39	49.67	49.7
11/15/00 12:44	53.89	41.4
11/15/00 12:49	55.97	34.4
11/15/00 12:54	58.04	30.5
11/15/00 12:59	60.11	28.6
11/15/00 13:04	62.17	25.8
11/15/00 13:09	63.54	25.3
11/15/00 13:14	64.91	25.8
11/15/00 13:19	66.28	24.4
11/15/00 13:24	66.96	22.2
11/15/00 13:29	67.65	22.6
11/15/00 13:34	69.02	21.3
11/15/00 13:39	68.33	21.8
11/15/00 13:44	67.65	23.1
11/15/00 13:49	67.65	24
11/15/00 13:54	66.96	23.1

Date + Time	Temperature (º F)	Relative Humid. %
11/15/00 13:59	66.28	23.5
11/15/00 14:04	66.28	24
11/15/00 14:09	65.59	23.5
11/15/00 14:14	65.59	23.1
11/15/00 14:19	65.59	23.1
11/15/00 14:24	66.28	22.2
11/15/00 14:29	66.96	21.8
11/15/00 14:34	67.65	21.3
11/15/00 14:39	66.96	21.8
11/15/00 14:44	66.96	22.6
11/15/00 14:49	66.96	22.6
11/15/00 14:54	66.96	22.6
11/15/00 14:59	66.28	23.1
11/15/00 15:04	66.96	23.1
11/15/00 15:09	66.96	23.1
11/15/00 15:14	67.65	22.6
11/15/00 15:19	67.65	24.4
11/15/00 15:24	68.33	23.5
11/15/00 15:29	68.33	23.1
11/15/00 15:34	71.08	20.9
11/15/00 15:39	73.15	18.7
11/15/00 15:44	74.53	17.1
11/15/00 15:49	75.92	15.9
11/15/00 15:54	77.31	15.5
11/15/00 15:59	78.01	15.5
11/15/00 16:04	78.01	16.3
11/15/00 16:09	77.31	17.1
11/15/00 16:14	76.62	17.5
11/15/00 16:19	75.92	18.3
11/15/00 16:24	75.22	19.2
11/15/00 16:29	74.53	20
11/15/00 16:34	73.84	20.9
11/15/00 16:39	73.15	22.2
11/15/00 16:44	72.46	24.4
11/15/00 16:49	71.77	24
11/15/00 16:54	71.08	24
11/15/00 16:59	69.71	24
11/15/00 17:04	69.71	22.6
11/15/00 17:09	70.39	20.9
11/15/00 17:14	71.08	19.2
11/15/00 17:19	72.46	18.3
11/15/00 17:24	73.15	20.9
11/15/00 17:29	73.15	22.2
11/15/00 17:34	73.15	24
11/15/00 17:39	72.46	24.9

Date + Time	Temperature (º F)	Relative Humid. %
11/15/00 17:44	71.77	24.9
11/15/00 17:49	71.08	24.9
11/15/00 17:54	70.39	24.9
11/15/00 17:59	69.71	25.8
11/15/00 18:04	69.02	25.8
11/15/00 18:09	68.33	25.8
11/15/00 18:14	66.96	26.7
11/15/00 18:19	66.28	26.7
11/15/00 18:24	65.59	27.2
11/15/00 18:29	64.91	27.7
11/15/00 18:34	64.22	27.7
11/15/00 18:39	63.54	28.1
11/15/00 18:44	62.85	28.1
11/15/00 18:49	62.17	28.6
11/15/00 18:54	61.48	28.6
11/15/00 18:59	55.28	36.4
11/15/00 19:04	51.08	41.4
11/15/00 19:09	48.96	48.1
11/15/00 19:14	45.38	55.9
11/15/00 19:19	43.92	61.6
11/15/00 19:24	43.19	65.2
11/15/00 19:29	42.46	66.2
11/15/00 19:34	41.72	70.3
11/15/00 19:39	41.72	71.8
11/15/00 19:44	41.72	70.8
11/15/00 19:49	40.97	71.3
11/15/00 19:54	40.23	72.8
11/15/00 19:59	40.97	73.8
11/15/00 20:04	40.97	76.2
11/15/00 20:09	40.23	78.1
11/15/00 20:14	40.23	81.9
11/15/00 20:19	40.23	79.6
11/15/00 20:24	39.48	81
11/15/00 20:29	38.72	84.2
11/15/00 20:34	39.48	85.1
11/15/00 20:39	38.72	83.3
11/15/00 20:44	38.72	82.8
11/15/00 20:49	38.72	84.2
11/15/00 20:54	39.48	81.9
11/15/00 20:59	37.97	82.8
11/15/00 21:04	37.97	89.9
11/15/00 21:09	38.72	95.1
11/15/00 21:14	38.72	94.7
11/15/00 21:19	38.72	93.5
11/15/00 21:24	38.72	89.5

Date + Time	Temperature (º F)	Relative Humid. %
11/15/00 21:29	37.97	89.5
11/15/00 21:34	37.97	89.5
11/15/00 21:39	37.97	91.1
11/15/00 21:44	37.97	95.1
11/15/00 21:49	37.2	93.9
11/15/00 21:54	37.2	94.7
11/15/00 21:59	37.97	95.1
11/15/00 22:04	37.2	94.3
11/15/00 22:09	36.43	95.5
11/15/00 22:14	36.43	96.6
11/15/00 22:19	36.43	97
11/15/00 22:24	36.43	98
11/15/00 22:29	36.43	97
11/15/00 22:34	36.43	97.3
11/15/00 22:39	36.43	98.7
11/15/00 22:44	36.43	98.4
11/15/00 22:49	36.43	98.7
11/15/00 22:54	35.66	100.1
11/15/00 22:59	35.66	101.4
11/15/00 23:04	35.66	102.3
11/15/00 23:09	35.66	102.6
11/15/00 23:14	35.66	102.9
11/15/00 23:19	35.66	102.9
11/15/00 23:24	35.66	103.2
11/15/00 23:29	34.88	103.5
11/15/00 23:34	35.66	103.5
11/15/00 23:39	35.66	103.2
11/15/00 23:44	35.66	103.2
11/15/00 23:49	36.43	102
11/15/00 23:54	36.43	102
11/15/00 23:59	35.66	101.4
11/16/00 0:04	35.66	100.8
11/16/00 0:09	34.88	101.1
11/16/00 0:14	34.88	102.3
11/16/00 0:19	34.1	102.9
11/16/00 0:24	34.1	103.2
11/16/00 0:29	34.1	103.5
11/16/00 0:34	34.1	103.8
11/16/00 0:39	34.1	103.8
11/16/00 0:44	33.31	104.1
11/16/00 0:49	34.1	104.1
11/16/00 0:54	34.1	104.1
11/16/00 0:59	34.1	104.1
11/16/00 1:04	33.31	104.1
11/16/00 1:09	33.31	104.1

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 1:14	33.31	104.1
11/16/00 1:19	33.31	104.1
11/16/00 1:24	33.31	104.1
11/16/00 1:29	32.52	104.1
11/16/00 1:34	32.52	104.1
11/16/00 1:39	32.52	104.1
11/16/00 1:44	33.31	104.1
11/16/00 1:49	33.31	104.1
11/16/00 1:54	32.52	104.1
11/16/00 1:59	33.31	104.1
11/16/00 2:04	32.52	104.1
11/16/00 2:09	32.52	104.1
11/16/00 2:14	32.52	104.1
11/16/00 2:19	32.52	104.1
11/16/00 2:24	32.52	104.1
11/16/00 2:29	32.52	104.1
11/16/00 2:34	33.31	104.1
11/16/00 2:39	32.52	104.1
11/16/00 2:44	32.52	104.1
11/16/00 2:49	32.52	104.1
11/16/00 2:54	32.52	104.1
11/16/00 2:59	31.72	104.1
11/16/00 3:04	31.72	104.1
11/16/00 3:09	31.72	104.1
11/16/00 3:14	31.72	104.1
11/16/00 3:19	31.72	104.1
11/16/00 3:24	31.72	104.1
11/16/00 3:29	31.72	104.1
11/16/00 3:34	32.52	104.1
11/16/00 3:39	32.52	104.1
11/16/00 3:44	32.52	104.1
11/16/00 3:49	31.72	104.1
11/16/00 3:54	32.52	104.1
11/16/00 3:59	33.31	104.1
11/16/00 4:04	34.1	104.1
11/16/00 4:09	34.1	104.1
11/16/00 4:14	34.1	104.1
11/16/00 4:19	33.31	104.1
11/16/00 4:24	33.31	104.1
11/16/00 4:29	33.31	104.1
11/16/00 4:34	32.52	104.1
11/16/00 4:39	32.52	104.1
11/16/00 4:44	33.31	104.1
11/16/00 4:49	32.52	104.1
11/16/00 4:54	32.52	104.1

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 4:59	32.52	104.1
11/16/00 5:04	32.52	104.1
11/16/00 5:09	32.52	104.1
11/16/00 5:14	31.72	104.1
11/16/00 5:19	32.52	104.1
11/16/00 5:24	32.52	104.1
11/16/00 5:29	32.52	104.1
11/16/00 5:34	31.72	104.1
11/16/00 5:39	31.72	104.1
11/16/00 5:44	32.52	104.1
11/16/00 5:49	32.52	104.1
11/16/00 5:54	31.72	104.1
11/16/00 5:59	32.52	104.1
11/16/00 6:04	33.31	104.1
11/16/00 6:09	33.31	104.1
11/16/00 6:14	33.31	104.1
11/16/00 6:19	33.31	104.1
11/16/00 6:24	33.31	104.1
11/16/00 6:29	32.52	104.1
11/16/00 6:34	32.52	104.1
11/16/00 6:39	32.52	104.1
11/16/00 6:44	31.72	104.1
11/16/00 6:49	32.52	104.1
11/16/00 6:54	32.52	104.1
11/16/00 6:59	32.52	104.1
11/16/00 7:04	32.52	104.1
11/16/00 7:09	33.31	104.1
11/16/00 7:14	34.1	104.1
11/16/00 7:19	34.1	104.1
11/16/00 7:24	33.31	104.1
11/16/00 7:29	34.1	104.1
11/16/00 7:34	34.1	104.1
11/16/00 7:39	34.88	104.1
11/16/00 7:44	37.2	104.1
11/16/00 7:49	37.97	104.1
11/16/00 7:54	39.48	104.1
11/16/00 7:59	40.23	104.1
11/16/00 8:04	40.23	104.1
11/16/00 8:09	40.23	104.1
11/16/00 8:14	40.97	103.2
11/16/00 8:19	40.97	102
11/16/00 8:24	41.72	101.7
11/16/00 8:29	43.19	99.1
11/16/00 8:34	44.65	95.9
11/16/00 8:39	46.1	90.7

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 8:44	46.1	81.5
11/16/00 8:49	46.1	75.2
11/16/00 8:54	46.82	71.8
11/16/00 8:59	46.82	68.8
11/16/00 9:04	47.53	66.7
11/16/00 9:09	47.53	65.7
11/16/00 9:14	47.53	64.7
11/16/00 9:19	47.53	62.1
11/16/00 9:24	48.25	63.2
11/16/00 9:29	49.67	62.1
11/16/00 9:34	49.67	59
11/16/00 9:39	49.67	56.4
11/16/00 9:44	49.67	57.5
11/16/00 9:49	49.67	54.3
11/16/00 9:54	50.38	52.8
11/16/00 9:59	50.38	50.7
11/16/00 10:04	49.67	48.1
11/16/00 10:09	51.08	48.6
11/16/00 10:14	51.79	47.1
11/16/00 10:19	51.08	46.5
11/16/00 10:24	51.79	47.1
11/16/00 10:29	51.79	45
11/16/00 10:34	52.49	45
11/16/00 10:39	52.49	45.5
11/16/00 10:44	52.49	44.5
11/16/00 10:49	52.49	44.5
11/16/00 10:54	52.49	42.9
11/16/00 10:59	53.19	41.9
11/16/00 11:04	53.19	40.9
11/16/00 11:09	53.19	40.9
11/16/00 11:14	52.49	41.9
11/16/00 11:19	52.49	41.4
11/16/00 11:24	52.49	40.9
11/16/00 11:29	52.49	41.9
11/16/00 11:34	52.49	41.9
11/16/00 11:39	53.19	41.4
11/16/00 11:44	53.19	40.4
11/16/00 11:49	53.19	40.4
11/16/00 11:54	53.19	39.9
11/16/00 11:59	53.19	39.9
11/16/00 12:04	53.19	41.4
11/16/00 12:09	53.19	41.9
11/16/00 12:14	53.19	41.9
11/16/00 12:19	53.89	41.4
11/16/00 12:24	53.89	40.9

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 12:29	54.58	41.4
11/16/00 12:34	53.89	40.9
11/16/00 12:39	53.89	40.4
11/16/00 12:44	55.28	39.9
11/16/00 12:49	55.97	38.9
11/16/00 12:54	55.28	39.4
11/16/00 12:59	55.28	39.9
11/16/00 13:04	55.28	39.4
11/16/00 13:09	55.28	38.9
11/16/00 13:14	55.28	39.4
11/16/00 13:19	55.28	38.9
11/16/00 13:24	55.28	39.4
11/16/00 13:29	55.28	40.4
11/16/00 13:34	55.28	39.9
11/16/00 13:39	55.28	41.4
11/16/00 13:44	55.28	40.4
11/16/00 13:49	55.28	39.9
11/16/00 13:54	55.28	39.4
11/16/00 13:59	55.28	39.4
11/16/00 14:04	55.28	38.9
11/16/00 14:09	55.28	39.4
11/16/00 14:14	55.28	38.9
11/16/00 14:19	55.28	39.9
11/16/00 14:24	54.58	39.4
11/16/00 14:29	54.58	38.9
11/16/00 14:34	54.58	39.4
11/16/00 14:39	53.89	39.9
11/16/00 14:44	53.89	40.4
11/16/00 14:49	53.89	40.4
11/16/00 14:54	53.89	40.4
11/16/00 14:59	53.89	40.4
11/16/00 15:04	53.89	41.4
11/16/00 15:09	53.89	41.4
11/16/00 15:14	53.89	41.4
11/16/00 15:19	53.89	41.4
11/16/00 15:24	53.89	42.9
11/16/00 15:29	53.89	42.9
11/16/00 15:34	53.89	42.9
11/16/00 15:39	53.89	41.9
11/16/00 15:44	53.19	42.9
11/16/00 15:49	53.19	42.9
11/16/00 15:54	53.19	42.9
11/16/00 15:59	53.19	43.5
11/16/00 16:04	53.19	46
11/16/00 16:09	52.49	52.8

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 16:14	51.08	60.6
11/16/00 16:19	50.38	63.2
11/16/00 16:24	50.38	64.7
11/16/00 16:29	50.38	63.7
11/16/00 16:34	50.38	62.6
11/16/00 16:39	50.38	62.1
11/16/00 16:44	51.08	61.1
11/16/00 16:49	51.08	58
11/16/00 16:54	51.08	56.4
11/16/00 16:59	51.08	55.9
11/16/00 17:04	51.79	56.9
11/16/00 17:09	51.79	53.3
11/16/00 17:14	51.79	52.8
11/16/00 17:19	51.79	53.3
11/16/00 17:24	51.79	53.3
11/16/00 17:29	51.79	53.8
11/16/00 17:34	51.79	54.9
11/16/00 17:39	51.79	54.3
11/16/00 17:44	51.79	54.9
11/16/00 17:49	51.79	56.9
11/16/00 17:54	51.79	56.9
11/16/00 17:59	51.79	56.4
11/16/00 18:04	51.79	58.5
11/16/00 18:09	51.79	58.5
11/16/00 18:14	51.79	58
11/16/00 18:19	51.08	58.5
11/16/00 18:24	51.08	60.1
11/16/00 18:29	51.08	59.5
11/16/00 18:34	51.08	60.1
11/16/00 18:39	51.08	59
11/16/00 18:44	51.08	59
11/16/00 18:49	51.08	59.5
11/16/00 18:54	51.08	59.5
11/16/00 18:59	51.79	59
11/16/00 19:04	51.79	58
11/16/00 19:09	51.79	58
11/16/00 19:14	51.79	59
11/16/00 19:19	51.79	58.5
11/16/00 19:24	52.49	56.9
11/16/00 19:29	52.49	55.4
11/16/00 19:34	52.49	56.4
11/16/00 19:39	52.49	57.5
11/16/00 19:44	52.49	56.4
11/16/00 19:49	52.49	56.4
11/16/00 19:54	52.49	55.9

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 19:59	52.49	55.9
11/16/00 20:04	52.49	55.9
11/16/00 20:09	52.49	55.9
11/16/00 20:14	52.49	56.9
11/16/00 20:19	52.49	56.4
11/16/00 20:24	52.49	57.5
11/16/00 20:29	52.49	57.5
11/16/00 20:34	53.19	58
11/16/00 20:39	55.97	53.8
11/16/00 20:44	58.04	50.7
11/16/00 20:49	58.04	48.6
11/16/00 20:54	60.8	47.1
11/16/00 20:59	66.28	44
11/16/00 21:04	66.28	41.4
11/16/00 21:09	67.65	36.4
11/16/00 21:14	67.65	35.4
11/16/00 21:19	68.33	33.4
11/16/00 21:24	69.02	32.9
11/16/00 21:29	69.71	31
11/16/00 21:34	70.39	29.5
11/16/00 21:39	70.39	29.5
11/16/00 21:44	71.08	28.6
11/16/00 21:49	71.08	28.6
11/16/00 21:54	71.08	27.7
11/16/00 21:59	71.08	28.1
11/16/00 22:04	71.08	27.7
11/16/00 22:09	71.08	27.7
11/16/00 22:14	71.08	27.2
11/16/00 22:19	71.08	27.2
11/16/00 22:24	71.77	26.7
11/16/00 22:29	71.77	27.2
11/16/00 22:34	71.77	27.2
11/16/00 22:39	71.77	27.2
11/16/00 22:44	71.77	27.7
11/16/00 22:49	71.77	28.1
11/16/00 22:54	71.08	28.6
11/16/00 22:59	71.08	29.5
11/16/00 23:04	70.39	31
11/16/00 23:09	69.71	32.9
11/16/00 23:14	68.33	32.4
11/16/00 23:19	66.96	32.9
11/16/00 23:24	65.59	32.9
11/16/00 23:29	64.91	33.4
11/16/00 23:34	63.54	33.9
11/16/00 23:39	62.85	34.4

Date + Time	Temperature (º F)	Relative Humid. %
11/16/00 23:44	62.17	34.4
11/16/00 23:49	61.48	34.9
11/16/00 23:54	60.8	35.4
11/16/00 23:59	60.11	35.4
11/17/00 0:04	59.42	35.9
11/17/00 0:09	58.73	36.4
11/17/00 0:14	58.73	36.4
11/17/00 0:19	58.04	36.9
11/17/00 0:24	57.35	36.4
11/17/00 0:29	57.35	36.9
11/17/00 0:34	56.66	36.9
11/17/00 0:39	56.66	37.4
11/17/00 0:44	56.66	37.4
11/17/00 0:49	55.97	37.4
11/17/00 0:54	55.97	37.4
11/17/00 0:59	55.28	37.9
11/17/00 1:04	55.28	37.9
11/17/00 1:09	55.28	37.9
11/17/00 1:14	54.58	38.4
11/17/00 1:19	54.58	38.4
11/17/00 1:24	54.58	37.9
11/17/00 1:29	54.58	38.4
11/17/00 1:34	53.89	38.4
11/17/00 1:39	53.89	38.4
11/17/00 1:44	53.89	38.4
11/17/00 1:49	53.19	38.9
11/17/00 1:54	53.19	38.4
11/17/00 1:59	53.19	38.4
11/17/00 2:04	53.19	38.4
11/17/00 2:09	53.19	38.9
11/17/00 2:14	52.49	38.9
11/17/00 2:19	52.49	38.9
11/17/00 2:24	52.49	38.9
11/17/00 2:29	52.49	39.4
11/17/00 2:34	52.49	38.9
11/17/00 2:39	51.79	38.9
11/17/00 2:44	51.79	38.9
11/17/00 2:49	51.79	38.9
11/17/00 2:54	51.79	39.4
11/17/00 2:59	51.79	39.4
11/17/00 3:04	51.08	39.4
11/17/00 3:09	51.08	39.4
11/17/00 3:14	51.08	38.9
11/17/00 3:19	51.08	39.4
11/17/00 3:24	50.38	39.4

Date + Time	Temperature (º F)	Relative Humid. %
11/17/00 3:29	50.38	39.4
11/17/00 3:34	50.38	39.4
11/17/00 3:39	50.38	39.4
11/17/00 3:44	50.38	39.9
11/17/00 3:49	49.67	39.9
11/17/00 3:54	49.67	39.9
11/17/00 3:59	49.67	39.9
11/17/00 4:04	49.67	39.9
11/17/00 4:09	49.67	39.9
11/17/00 4:14	49.67	40.4
11/17/00 4:19	49.67	40.4
11/17/00 4:24	48.96	39.9
11/17/00 4:29	48.96	39.9
11/17/00 4:34	48.96	39.9
11/17/00 4:39	48.25	39.9
11/17/00 4:44	48.25	39.9
11/17/00 4:49	48.25	40.4
11/17/00 4:54	47.53	39.9
11/17/00 4:59	47.53	39.9
11/17/00 5:04	46.82	40.4
11/17/00 5:09	46.82	39.9
11/17/00 5:14	46.82	39.9
11/17/00 5:19	46.1	39.9
11/17/00 5:24	46.1	39.9
11/17/00 5:29	45.38	39.9
11/17/00 5:34	45.38	40.4
11/17/00 5:39	45.38	40.4
11/17/00 5:44	44.65	40.4
11/17/00 5:49	44.65	40.4
11/17/00 5:54	43.92	40.4
11/17/00 5:59	43.92	40.9
11/17/00 6:04	43.92	40.4
11/17/00 6:09	43.19	40.9
11/17/00 6:14	43.19	40.9
11/17/00 6:19	42.46	40.4
11/17/00 6:24	42.46	40.9
11/17/00 6:29	42.46	40.9
11/17/00 6:34	41.72	40.9
11/17/00 6:39	41.72	41.4
11/17/00 6:44	41.72	41.4
11/17/00 6:49	40.97	40.9
11/17/00 6:54	40.97	41.4
11/17/00 6:59	40.97	41.9
11/17/00 7:04	40.97	41.9
11/17/00 7:09	40.97	41.9

Date + Time	Temperature (º F)	Relative Humid. %
11/17/00 7:14	40.97	41.9
11/17/00 7:19	40.97	42.4
11/17/00 7:24	40.97	42.4
11/17/00 7:29	40.97	42.4
11/17/00 7:34	40.97	42.4
11/17/00 7:39	42.46	54.3
11/17/00 7:44	44.65	67.2
11/17/00 7:49	46.82	68.8
11/17/00 7:54	47.53	69.3
11/17/00 7:59	48.25	71.3
11/17/00 8:04	48.96	71.3
11/17/00 8:09	49.67	69.3
11/17/00 8:14	50.38	66.7
11/17/00 8:19	50.38	65.2
11/17/00 8:24	50.38	62.6
11/17/00 8:29	50.38	61.1
11/17/00 8:34	50.38	60.1
11/17/00 8:39	50.38	61.6
11/17/00 8:44	58.04	73.8
11/17/00 8:49	62.85	60.6
11/17/00 8:54	65.59	52.8
11/17/00 8:59	67.65	48.6
11/17/00 9:04	69.02	47.1
11/17/00 9:09	70.39	45.5
11/17/00 9:14	71.77	43.5
11/17/00 9:19	72.46	42.9
11/17/00 9:24	72.46	41.9
11/17/00 9:29	73.15	41.9
11/17/00 9:34	73.15	40.9
11/17/00 9:39	73.15	40.9
11/17/00 9:44	73.84	40.4
11/17/00 9:49	73.84	40.4
11/17/00 9:54	73.84	40.9
11/17/00 9:59	73.84	40.4
11/17/00 10:04	74.53	39.9
11/17/00 10:09	74.53	40.4
11/17/00 10:14	74.53	40.9
11/17/00 10:19	74.53	40.4
11/17/00 10:24	74.53	39.9
11/17/00 10:29	75.22	39.9
11/17/00 10:34	75.22	39.9
11/17/00 10:39	75.22	39.4
11/17/00 10:44	75.92	38.9
11/17/00 10:49	75.92	38.4
11/17/00 10:54	75.92	37.9

Date + Time	Temperature (º F)	Relative Humid. %
11/17/00 10:59	75.92	38.4
11/17/00 11:04	75.92	37.9
11/17/00 11:09	75.92	37.9
11/17/00 11:14	75.92	37.4
11/17/00 11:19	75.92	37.9
11/17/00 11:24	75.92	37.4
11/17/00 11:29	75.92	37.4
11/17/00 11:34	75.92	41.4
11/17/00 11:39	76.62	41.9
11/17/00 11:44	76.62	41.4
11/17/00 11:49	76.62	40.9
11/17/00 11:54	76.62	40.9
11/17/00 11:59	76.62	40.4

Appendix D
Field Test Report McKenna MOUT Facility

Final Report

On

Force Medical Protection Advanced Concept Technology Demonstration McKenna MOUT Facility Fort Benning, Georgia 9-13 April 2001

To

US Marine Corps System Command (MARCORSYSCOM)

June 30, 2001

By

BD Lerner, RK Smith, CA McKay, LA Hernon-Kenny, FR Moore

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ABBREVIATIONS/ACRONYMS

ACTD	*Advanced Concept Technology Demonstration*
ASAP	*As soon as possible*
ATD-400	*A thermal desorption device that is manufactured by Perkin-Elmer Corporation*
CA	*Chemical agent*
CB	*Chemical-biological (usually modifies the word agent)*
COTS	*Commercial Off-the-Shelf*
CBIS	*Chemical Biological Individual Sampler*
FMP	*Force Medical Protection*
GC	*Gas chromatograph*
GD	*Chemical agent Soman (Pinacolyl methyl phosphonofluoridate)*
IPCS	*Individual Passive Chemical Sampler*
IDLH	*Immediately dangerous to life and health*
LFPM	*Linear feet per minute*
MARCORSYSCOM	*Marine Corps Systems Command*
MES	*Methyl Salicylate (Oil of Wintergreen), a common chemical simulant for HD*
MSD	*Mass Selective Detector; an Agilent Corporation Mass Spectrometer specifically designed for use as a GC detector.*
ORI	*Operational Readiness Inspection*
P-E	*Perkin-Elmer Corporation*
PPE	*Personal Protective Equipment (e.g. respirator, suit, boots, and gloves)*
RH	*Relative humidity, percent*
SKC	*SKC Corporation*
SOP	*Standard Operating Procedure*
TIC	*Toxic Industrial Chemical*
TMB	*Trimethyl Benzene*
TWA	*Time-weighted average (maximum allowed concentration for unprotected full-shift occupational exposure)*

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1.0 INTRODUCTION

Currently a true integrated Nuclear - Biological – Chemical (NBC) defense and force health protection system that is designed to sample low levels of chemical agent (CA) exposure does not exist. These low levels are below those that would cause immediate symptoms, and are below the levels found by the CA detectors currently used in the field. In addition these CA detectors generally do not respond to toxic industrial chemicals (TIC), which also are a threat to the health of the warfighter. This lack of information seriously impedes the force commander's ability to make informed decisions in the field about contamination avoidance or force protection. Further, the force medical protection community lacks the means to measure and record the individual warfighter's exposure to low levels of chemical and biological (CB) agent or TICs. This information is crucial to assess the risk to individuals to continued low-level exposure and to diagnose near and long term health monitoring and treatment programs.

The CBIS concept addresses this need by evaluating the presence and/or absence of CB agents or TICs. The CBIS system will provide non-intrusive capability to measure sub-clinical exposures to these toxic materials and provide exposure data for health surveillance.

1.1 BACKGROUND

Initial CBIS activities are designed around the use of commercial Individual Passive Chemical Sampler (IPCS). These samplers are intended for use by workers in industrial environments. The samplers are generally constructed as small, wearable badges that contain Tenax, which is a commonly used wide-spectrum absorbent for air-borne materials.

The environment of the warfighter is, bluntly stated, chemically dirty. In addition to normal environmental contaminants like dust, there are vehicle fumes, fuel vapors, gases from fired weapons, and miscellaneous materials like smoke obscurants. In addition to military contaminates, there are harmful environmental contaminates likes pesticides, polychlorinated biphenyls and toxic industrial chemicals.

The strategy for prior testing was to conduct laboratory testing for the ability of Commercial-Off-The-Shelf (COTS) samplers to detect chemical agent at the TWA and the IDLH. This testing was performed at the Battelle HMRC in early 2000 and was reported in a separate report.

A field test was then performed by deploying the COTS samplers during live fire exercises being conducted by a Marine Corps Security Field Battalion at Fort A.P. Hill, Virginia. The samplers used were from W.L. Gore and SKC Corporation and were the same samplers as evaluated above. The Gore samplers are composed of two small Tenax-containing packets (often referred to as pillows) inside a larger, permeable envelope. There are two designs from the SKC Corporation. The first, earlier SKC design incorporated a small, metal button that contained Tenax completely inside a plastic badge; this button is approximately 1 cm high by 1.5 cm wide, similar in size and appearance to a kitchen faucet water aerator. Analysis required that the plastic badge be broken into its component halves, and the Tenax-containing metal button removed and placed into a thermal desorber. In order to reduce sampling handling times, the second, later SKC design encased the Tenax directly inside the badge's plastic housing. Removal of the Tenax simply required removing the badge back and dumping the material directly into a thermal desorption tube. This design change was accepted for later testing in this program and the original button design was dropped.

A modified GoreSorber® has also been submitted and is being tested in this program. The modifications include a change in the granularity of the sorbent (Tenax), removal of the tail used to hang the sorber from a button, and addition of an impermeable backing on the sorber. These sorbers are referred to as the "new GoreSorbers®" in this report.

2.0 OBJECTIVES

The objectives for this study were:

- Demonstrate the ability of the IPCS to function in a battlefield environment. This included trying to access the IPCS' ability to absorb analytes of interest when contaminated with battlefield environmental chemicals as well as the ability of the IPCS to yield accurate results once contaminated with battlefield environmental chemicals;
- Determine how long the samplers will take to process, using the current state of technology.

- Determine what environmental chemicals could be collected by the course of wear in the battlefield.

3.0 TEST STRATEGY

A total of 192 samplers were used exposed in the exercise. This is shown in Table 3.1 below. The exposed samplers were broken out into four groups; three for wear cycles for the troops and one for controls. The control group samplers were statically exposed to the exercise area environment by mounting them outside on a board. Both Gore samplers and passive air samplers from SKC Inc were used in this static position.

Pre-exercise MES exposure was done prior to deployment using to methyl salicylate (MES), which is a common non-toxic chemical surrogate for HD. These pre-exposed IPCS badges would have the amount of MES analyzed after battlefield exposure. This analysis would demonstrate how well the IPCS badges would retain the target analyte after field exposure; additionally, this would demonstrate what analytical interferents would be present from battlefield exposure.

The bulk of the remaining badges are analyzed after use, but are not deliberately exposed to chemicals in the laboratory. A group of samplers were exposed to MES after field deployment as a demonstration of how well the badges would retain target analytes after being contaminated with battlefield chemicals.

This plan is summarized in Table 3.1:

Table 3.1 Summary Of IPCS MES Exposure And Analysis

Grouping	Sampler Exposure	Number of Samplers of Type Used in Exercise
1st wear cycle (50 total – old Gore)	Pre-exercise MES exposure	25
	Post-exercise MES exposure	0
	No Exposure	25
2nd wear cycle (50 total – new Gore)	Pre-exercise MES exposure	10
	Post-exercise MES exposure	10
	No Exposure	30
3rd wear cycle (50 total – new Gore)	Pre-exercise MES exposure	10

Grouping	Sampler Exposure	Number of Samplers of Type Used in Exercise
	Post-exercise MES exposure	10
	No Exposure	30
Controls (42 total – 28 new Gore, 14 new SKC)	Pre-exercise MES exposure	7 Gore 7 SKC
	Post-exercise MES exposure	7 Gore
	No Exposure	14 Gore 7 SKC
Total		178 Gore 14 SKC

3.1 TEST PHASE

3.1.1 MES EXPOSURE TEST DESIGN

Dosing of the samplers was done with MES vapor. This was done to approximate field conditions. Dosing in this manner required that the samplers be exposed to a moving air stream of at least 20 linear feet per minute (20 LFPM).

Previous work using chamber exposure had been done using a carousel arrangement. Because this chamber had been used for nerve agent work, this carousel exposure chamber could not be used to expose samplers that were to be worn. Thus a new carousel chamber was constructed.

In this system, a sampler is mounted on the central carousel with its face pointed along the radius of the circle so that air is moved tangentially across the sampler face. The carousel is rotated to give a velocity of at least 20 LFPM across the face. Air is moved through the 30-liter volume system at a flow rate of at least 10 liters/minute so that the chemical mixture in the system is replenished.

For the pre-exercise-doped samplers, adding vaporous MES to this air stream was done by diverting a low airflow from the output of the main stream through the headspace of a glass vial containing MES. This airflow was combined with the main airflow at the chamber head by means of a t-connector that pointed into the main airflow. In practice, the MES air flow was set between 250 and 550 cubic centimeters per minute, as measured by a Buck Calibrator placed in-line from the air flow diversion point to the glass vial; once set, the air flow remained constant. In this configuration the chamber was run for several hours and the MES concentration was

determined by analysis of several sorbers, which allowed estimation of the MES in the chamber. In addition, although efforts were made to minimize the presence of absorptive surfaces, running the chamber for several hours would saturate these surfaces and remove this source of error.

The pre-deployment exposure group of samplers was dosed with MES vapor just prior to being shipped to the field exercises. Dosing was done using two groups so that low and high concentrations could be approximated. When these samplers were exposed, additional exposure control samplers were included on the rack so the MES loading could be checked.

After exposure, these samplers were repackaged and sent to the field. A Hobo H8 Pro data logger was also included to record temperature and relative humidity (RH) at 30-minute intervals. This data logger was maintained with the badges during field exposure, and allowed tracking of the environment to which the samplers were exposed. The data logger was also used to verify the humidity and temperature conditions inside the chamber before challenging the samplers and was kept with the samplers during storage before analysis. Thus, this recorder provides the history of the pre-exposure-challenged samplers.

3.1.2 Analytical Method

Sample preparation of the IPCS units is discussed in the **Results** section because of its importance in meeting one of the objectives of this study. All sample preparation activities were designed to put the sorbent or its contents into a tube so that thermal desorption could be done. Specifically, analysis of the samplers was done on an ATD-400 thermal desorber coupled to an Agilent 6890 GC/5973 MSD (this is equipped with a turbo pump, as required by the ATD). Conditions are summarized in Table 3.2.

Table 3.2 ATD-400/GC/MSD Conditions

Parameter	Value
Column	Restek RTX-5, 30 m x 0.25 mm i.d. Film thickness 0.25 micron
Gas Flow	24 psi; constant pressure mode
Temperature Program	40 ºC Hold 2 minutes Ramp 20 ºC/minute 250 ºC Hold 3 minutes
Mass Spectrometer	Electron Ionization, scanning between 45 and 350 amu

4.0 RESULTS

4.1 PRE-DEPLOYMENT ACTIVITIES

The samplers were all recorded on custody sheets. Samplers for pre-exposure were then exposed in the carousel along with several control samplers. The control samplers were then analyzed.

Analysis of the exposure controls samplers showed one unanticipated problem; the amount of MES loaded on the samplers was at the upper end of the 500 ng planned pre-exposure dosing level regardless of chamber operation. This problem was attributed to variations in air flow rate from the generator during exposure and possibly hold-up in the chamber. No other logical conclusion could be established.

The pre-exposed samplers for the first week tests (old GoreSorbers®) were packaged with a HOBO data collection device and shipped to the field exercise. The pre-exposed samplers for the second week of tests (new GoreSorbers® and SKC samplers) were shipped with a second HOBO. Because the conditions on site were similar for both HOBOs, only the data from the first HOBO is provided in Appendix A.

4.2 DEPLOYMENT ACTIVITY REPORT

4.2.1 DEPLOYMENT DESCRIPTION

The second venue for the FMP ACTD demonstration took place at the McKenna MOUT facility in Fort Benning, Georgia on 9-13 April 2001. The members of the Marine Corps Security Force Battalion (MCSF Bn), 6th Platoon, 1st Fast Company, participated in the assessment part of the demonstration.

On 3 April, the 6th Platoon was issued new improved armbands and GoreSorber samplers in Norfolk, VA. Both devices were redesigned due to the low sampler recovery rate from the first demonstration, which took place at Fort AP Hill and Camp Allen. (Both in Virginia) The new armband features two closable pockets for the Gore and SKC samplers with open netting in the

front to allow absorption. The armbands from the first demonstration were loose fitting and as a result, changes were made into three sizes (S, M, L) to better fit each Marine.

To record the sampler number of each Marine, a barcode system was implemented with the use of a scanner and a database of the entire Platoon Roster. The platoon received their sampler and armband by squad order/team order. Each sampler had a barcode on its back. The issuing officer would scan the barcode and the number was automatically entered into the highlighted field. The issuing officer clicked a button to insert the date and time. This process continued until each Marine received an armband and a sampler. After the armbands and samplers were distributed, each Marine was responsible for keeping on their person at all times except for in the shower.

The 6th Platoon arrived in Ft. Benning on 4 April in the evening. The Marines took advantage of having the McKenna MOUT facility for the weekend by practicing their tactics and movements in an urban terrain. The MOUT facility personnel, OP4, participated in the training by taking the role of the terrorist threat in the town. Simmunitions were used for training, and smoke pots were tested to record wind direction and gas dispersal.

The first collection of samplers took place on the morning of 9 April. Each Marine turned in their sampler and was issued a new one. The date and time was recorded for both the retrieval and the issuance of each sampler. There was a major difference in the number of sampler received compared to the last FMP ACTD demonstration in November 2000. The clasp mechanism from the last demonstration resulted in a low return rate of samplers. Misplacement of the armband resulted in the loss of a sampler. Recovery numbers were dramatically lower for this demonstration.

A pager was issued to each Marine the morning of 9 April. The pager was used to simulate an alarm system warning the Marine of a chemical presence in the vicinity. A satellite overhead system was used and provided by the MOUT facility. The satellite system helped track individual Marines throughout the facility. This proved useful to determine which Marine would get a simulated alarm. Depending on the location of the Marine on the main facility map, that Marine was sent a page to warn him of a possible chemical threat in the area. Sampler distribution and collection took place on the 3, 9, and 11 April.

There were a total of 11 runs throughout the week, each with different objectives. Briefs were conducted to the Marines to present the mission objective, mission priority level, and

chemical threat level. Each run began from a starting location with the Marines in a level of MOPP gear. As they approached the village, an alarm was sent simulating the active system. Depending on orders given from the CO, the Marine upgraded his protective posture, or continued with the mission. The runs varied in use of CS smoke; smoke pots, and the paging alarm system. The simulated alarm runs varied by sending an alarm to squad and team leaders only, or by sending an alarm to different individuals in the platoon. After each run, surveys were given out and a debrief was held concerning the completed run.

Twice during the week, samplers were collected. Samplers were taken by the NBC collection officer wearing gloves, and placed in a sterilized glass vial. Them Marine removed the sampler from the armband and confirmed the sampler number to the one listed in the database. If both were correct, the date and time received was recorded. If the wrong sampler was collected, comments were written in the database for this error. The NBC personnel asked each Marine if he was exposed to any chemicals during ht demonstration. This information was also recorded into the database. Each glass vial was closed and a tamper evident custody sticker was placed on top. This process continued for each Marine. Each vial was placed into a cardboard box that contained slots for protection. The box was then placed into an inner bag of a model STP-740 Saf-t-Pak shipping bag with one absorbent sheet and sealed. The outer Tyvek envelope of the STP-740 was sealed and a tamper custody label was placed. A cycle report was printed out containing the sampler numbers, and any comments from the NBC officer concerning the samplers. After the NBC officer signed the report, all were placed in a FedEx box and shipped to the lab (Battelle HMRC).

4.2.2 ENVIRONMENTAL CONDITIONS DURING THE FIELD EXERCISE

The output from the selected data logger is shown in Figure 4.2.1 and 4.2.2 (raw data is presented in Appendix A). Figure 4.2.1 displays the temperature while Figure 4.2.2 displays relative humidity (RH). Figure 4.1.2 shows the relative humidity over the same time period. On average, or the period shown, the temperature was 23 C +/- 4 C (73 F) with a maximum-recorded value of 35^{o}C and a minimum of 12C. The relative humidity averaged 56% +/- 20%, with a maximum reading of 98% and a minimum reading of 34.2%.

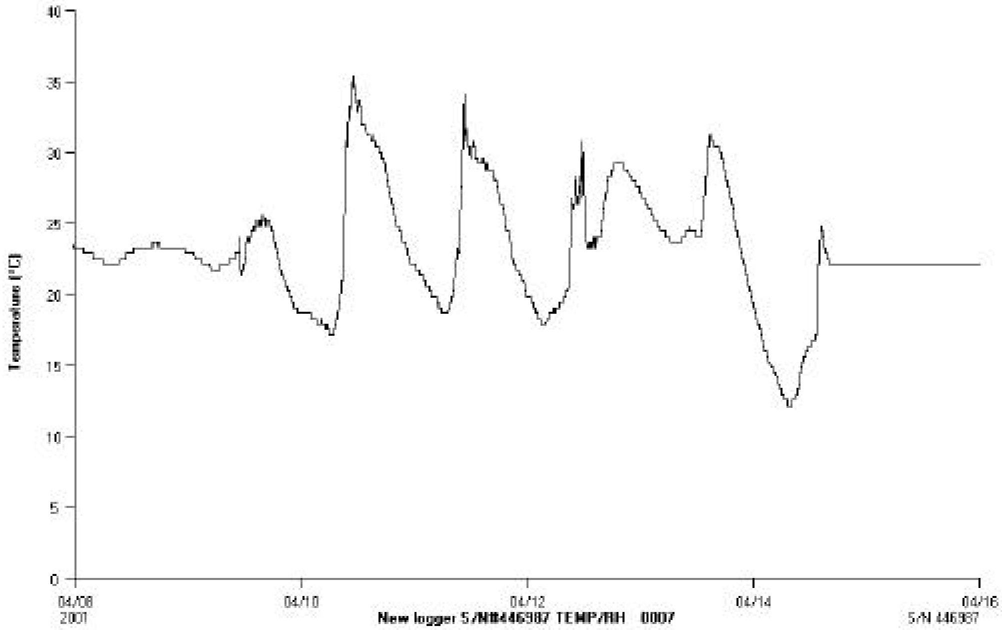

Figure 4.1 Temperature (ºC) Recorded In The Exercise Area

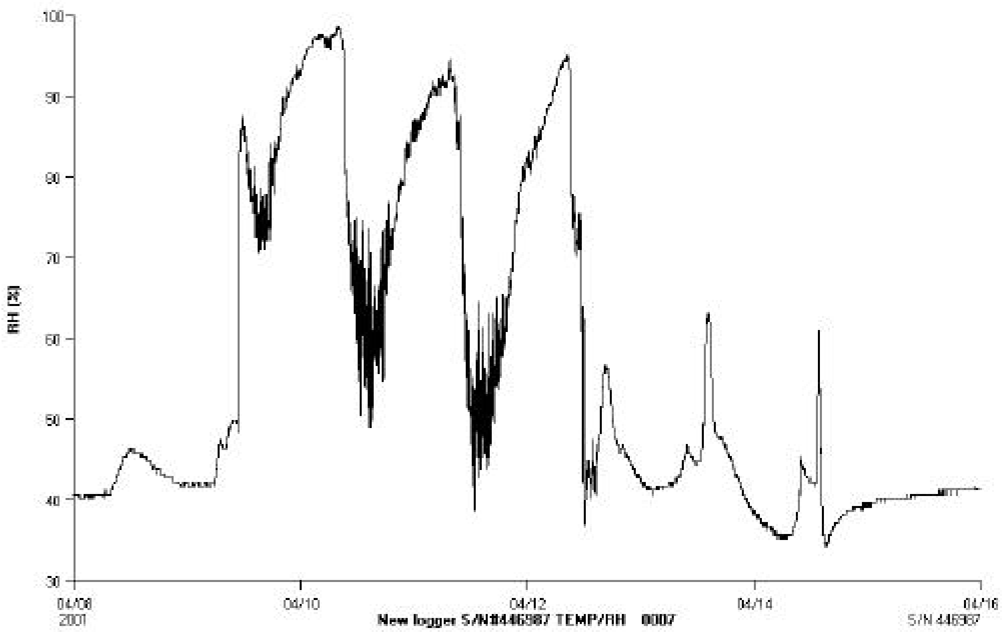

Figure 4.2 Relative Humidity (%) Recorded During The Exercise

4.3 POST-DEPLOYMENT ACTIVITIES

Upon return to the laboratory, the samplers were either analyzed or else held for post-deployment MES exposure. For the samplers that were analyzed upon return, the samplers were screened for the following compounds in addition to MES: n-butyl isocyanate, benzene, ethyl benzene, trimethyl benzene, trichloroethane, limonene, GD, HD and dimethyl-2,2-dichlorovinylphosphate (DDVP). These compounds indicate exposure to fuel and weapons combustion products, and thus are expected on the modern battlefield.

The data is grouped according to wear cycle. As expected, there was no HD or GD detected in any of the fielded samplers. There was also no n-butyl isocyanate, trichloroethylene or DDVP detected in any sampler as well. These non-detect results are excluded from the results tables.

Table 4.1 shows the analytical results from the **First Wear Cycle**. The first wear cycle lasted 6 days. All samplers were old style Gores. Results are sorted according to squad and fire team, which are the common sub-divisions within the Marine Platoon. There were instances where the squad and fire team data was not available; these are marked "NR".

Table 4.1 Results for Pre- and Post –Deployment MES, Benzene, Ethyl Benzene, Trimethyl Benzene, Undecane and Limonene for Wear Cycle One in Nanograms (ng)[*]

Sampler Number	Squad	Fire Team	Pre-Deployment MES Concentration (ng)	Post -Deployment MES Concentration (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)
20	1	1	0	95	13	17	108	1006	26545
22	1	1	0	144	14	25	148	1789	3037
21	1	2	0	435	14	17	359	1167	7148
26	1	2	621	353	13	18	307	1140	6353
39	1	2	621	353	14	19	130	1225	3492
32	1	3	621	2716	13	15	206	1054	5585
33	1	3	621	315	14	17	166	1056	4312
193	1	3	0	96	13	14	194	1153	5120
200	1	NR	0	191	23	28	132	2927	3057
31	2	1	621	327	13	18	230	949	5310
34	2	1	621	290	13	20	749	928	8812
38	2	1	621	568	14	23	375	448	7179
37	2	2	621	363	16	23	123	1064	2969
194	2	2	0	116	14	20	387	1131	7450

[*] There was no detection of the following analytes in any of the fielded samplers: n-butyl-isocyanate, trichloroethane, HD, GD and DDVP.

195	2	2	0	61	15	28	330	770	7050
18	2	3	0	97	13	32	829	1352	10274
19	2	3	0	66	14	26	349	867	7166
188	2	3	0	68	14	34	620	733	7709
191	2	3	0	137	12	20	589	1033	8400
199	2	3	0	59	12	17	479	764	8698
16	3	1	0	66	16	32	249	1290	5976
23	3	1	0	84	13	21	297	1376	9594
190	3	1	0	69	14	23	189	1397	5053
17	3	2	0	57	13	18	281	1243	6880
46	3	2	554	396	15	21	320	716	5923
198	3	2	0	77	12	25	380	1519	6888
29	3	3	621	327	13	18	182	1973	5160
35	3	3	621	368	13	19	151	1403	4467
36	3	3	621	309	13	17	304	1428	7550
41	3	3	621	341	13	17	444	1659	7644
24	3	NR	0	10	15	21	84	1388	2529
40	NR	NR	621	336	14	30	74	586	1690
45	NR	NR	554	307	10	34	260	512	3244

Table 4. 2 and Table 4.3-3 summarize the MES results for **Wear Cycle Two** and **Wear Cycle Three** respectively. These both used new style Gore samplers. The same trends are present in these results as for **Wear Cycle One**. Curiously, the loss of MES on the **Wear Cycle Three** samplers is relatively high, considering the relatively short deployment period. Specifically, **Wear Cycle One** samplers, which were old style Gore samplers loaded with approximately 600 ng of material, lost between 40 and 50 percent of the MES over their 6 day use.

Table 4.2 Results for Pre- and Post –Deployment MES, Benzene, Ethyl benzene, Trimethyl Benzene, Undecane and Limonene for Wear Cycle Two in Nanograms (ng)*

Sampler Number	Squad	Fire Team	Pre-Deployment MES Concentration (ng)	Post -Deployment MES Concentration (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)
115	1	1	0	14	26	10	25	204	650
117	1	1	0	16	14	11	37	266	810
118	1	1	0	16	22	8	195	241	7348
116	1	2	0	22	31	11	36	179	776
119	1	2	0	17	14	10	32	126	914
120	1	2	0	15	13	8	32	102	805
121	1	3	0	13	13	11	46	149	2358

Sampler Number	Squad	Fire Team	Pre-Deployment MES Concentration (ng)	Post -Deployment MES Concentration (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)
123	1	3	0	13	16	8	59	348	1264
124	1	3	0	13	14	9	87	89	2070
125	1	3	0	42	17	11	67	153	1454
113	1	NR	0	18	33	24	67	1006	1456
105	2	1	200	175	23	9	49	117	1022
126	2	1	0	71	14	11	95	112	2088
127	2	1	0	8	16	11	59	103	1419
106	2	2	200	187	15	12	133	189	2355
114	2	2	0	17	13	26	50	319	925
131	2	2	0	30	5	6	45	75	312
107	2	3	200	161	32	13	119	126	2847
109	2	3	200	177	15	13	150	125	3471
128	2	3	0	32	25	21	129	294	3574
122	2	NR	0	15	14	14	26	224	652
103	3	1	200	175	17	12	66	236	1518
104	3	1	200	193	17	9	41	290	971
108	3	2	200	193	29	13	76	311	1861
101	3	3	200	176	13	8	40	302	811
102	3	3	200	202	13	10	32	256	804
110	3	3	200	186	16	8	31	352	754
98	NR	NR	0	13	13	17	38	139	972
99	NR	NR	0	67	6	21	37	273	283

*There was no detection of the following analytes in any of the fielded samplers: n-butyl-isocyanate, trichloroethane, HD, GD and DDVP.

Table 4.3 Results for Pre- and Post –Deployment MES, Benzene, Ethyl benzene, Trimethyl Benzene, Undecane and Limonene For Wear Cycle Three in Nanograms (ng)*

Badge Number	Squad	Fire Team	Pre-Deployment MES Concentration (ng)	Post -Deployment MES Concentration (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)
74	1	1	0	18	6	7	56	136	353
75	1	1	0	11	8	4	14	90	129
51	1	2	300	175	6	6	20	112	180
68	1	2	0	19	7	5	15	91	177
73	1	3	300	192	7	7	47	111	478
54	1	3	300	184	9	8	33	123	268
55	1	3	300	208	5	6	20	98	260
56	1	3	0	8	5	6	18	91	150
80	2	1	300	229	4	5	33	84	282
52	2	1	300	177	8	8	43	131	318
53	2	2	300	179	5	7	88	78	704
57	2	2	0	10	5	14	22	78	189
71	2	2	0	31	5	13	73	117	537

72	2	3	300	192	6	11	96	102	612
58	2	3	300	209	7	8	100	123	754
59	2	3	300	188	5	8	147	411	1092
60	2	3	0	19	4	14	120	136	650
79	3	1	0	7	6	6	34	77	230
77	3	1	0	14	11	8	40	193	322
81	3	1	0	9	8	8	34	174	255
84	3	1	0	22	7	7	29	163	232
86	3	2	0	20	7	8	67	254	543
76	3	2	0	26	5	7	50	147	462
82	3	2	0	13	15	10	51	208	359
85	3	3	0	9	18	7	31	176	211
94	3	3	0	8	11	6	28	140	245
96	3	3	0	50	13	6	29	150	232
78	3	NR	0	18	6	10	29	115	206

* There was no detection of the following analytes in any of the fielded samplers: n-butyl-isocyanate, trichloroethane, HD, GD and DDVP.

The **Wear Cycle Three** samplers, which were new style GoreSorbers® pre-exposed with 300 ng of MES and were deployed for approximately 2 days, lost between 30 and 40 percent of the original MES based on "before and after" analyses. However, this loss estimate may have other reasons as discussed later.

4.4 CONTROL (STATIC) SAMPLERS

As noted earlier, 28 of the new style Gore samplers and 15 of the SKC samplers were mounted on a board in the exercise area. Different groups were deployed at for various periods. Seven of the Gore samplers and seven of the SKC samplers were pre-exposed to MES. Seven more of the Gore were exposed to MES after their return to the laboratory; these will be discussed separately.

The results for the pre-deployment MES exposed samplers and non-exposed samplers are shown in Table 4.4. The results generally mirrored those of the warfighter deployed samplers in the analytes found, but the quantities were generally much lower. In addition, the variability was much less for these samplers.

Table 4.4 Results for Pre- and Post –Deployment MES, Benzene, Ethyl Benzene,Trimethyl Benzene, Undecane and Limonene For Control Board Samplers in Nanograms (ng)

Sampler	Date Out	Date In	Pre-Deployment MES (ng)	Post-Deployment MES (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)

Sampler	Date Out	Date In	Pre-Deployment MES (ng)	Post-Deployment MES (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)
SKC									
1	Apr. 9	12	0	50	27	203	20	130	114
2	Apr. 9	12	0	27	33	21	6	62	23
3	Apr. 9	12	0	26	9	19	5	61	19
4	Apr. 9	12	0	27	33	18	4	53	25
5	Apr. 9	12	0	27	32	18	5	62	20
6	Apr. 9	12	0	27	28	20	4	56	18
7	Apr. 9	12	0	27	31	17	5	60	25
8	Apr. 9	12	274	106	29	20	6	56	28
9	Apr. 9	12	274	106	29	14	5	40	25
10	Apr. 9	12	274	111	27	20	6	59	35
11	Apr. 9	12	274	109	29	22	5	74	26
12	Apr. 9	12	274	117	28	26	6	85	38
13	Apr. 9	12	274	107	28	19	6	49	31
14	Apr. 9	12	274	107	31	25	7	59	33
15	Apr. 9	12	0	26	29	13	5	58	60
Gore									
150	Apr. 9	12	363	152	7	3	2	20	15
151	Apr. 9	12	363	163	6	3	3	22	14
152	Apr. 9	12	363	155	7	4	3	48	7
153	Apr. 9	12	363	163	7	4	3	44	24
154	Apr. 9	12	363	156	7	3	3	24	15
155	Apr. 9	12	363	159	7	3	2	22	22
156	Apr. 9	12	363	174	5	2	2	20	17
158	Apr. 9	12	0	25	6	3	1	23	10
159	Apr. 9	12	0	5	6	3	4	25	19
160	Apr. 9	12	0	5	5	4	4	26	18
161	Apr. 9	12	0	6	7	4	5	35	19
162	Apr. 9	12	0	6	7	4	4	27	19
163	Apr. 9	12	0	5	6	3	3	30	22
164	Apr. 9	12	0	6	7	4	2	31	22
165	Apr. 9	10	0	3	5	2	1	11	49
166	Apr. 9	10	0	3	4	2	2	10	47
167	Apr. 9	10	0	4	5	2	2	11	25
168	Apr. 9	10	0	3	5	2	3	13	22
169	Apr. 9	10	0	3	6	3	3	23	23
170	Apr. 9	10	0	3	20	2	2	8	17
171	Apr. 9	10	0	8	7	12	8	49	50
172	Apr. 10	12	0	5	5	3	4	31	19
173	Apr. 10	12	0	8	7	12	8	41	31
174	Apr. 10	12	0	5	6	4	4	38	25
175	Apr. 10	12	0	5	7	5	5	25	22
176	Apr. 10	12	0	5	7	4	4	27	21
177	Apr. 10	12	0	10	7	17	12	93	65
178	Apr. 10	12	0	4	11	4	4	40	17

4.5 POST-EXPOSURE SPIKE ANALYSIS

Several of the Wear Cycle Two, Three and Control Board samplers were exposed MES after deployment. This tested the ability of the samplers to absorb material after they had been in the field. The results of the post exposure, along with the results for the remaining analytes, are shown in Table 4.5. As before, there was no n-butyl-isocyanate, GD, HD or DDVP detected in any sample except for #139, where 4 ng of n-butyl isocyanate was found; these analytes are excluded from the table for brevity.

Table 4.5 Results from Samplers Exposed to MES After Deployment

Sample Name	Wear Cycle	Squad	Fire Team	Post MES Exposure (ng)	Found MES (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)
Exposure					100	8	3	1	2	9
130	2	2	2	100	119	8	8	24	22	212
132	2	2	3	100	126	8	14	69	56	558
133	2	3	NR	100	178	16	10	10	86	106
134	2	3	1	100	104	7	13	17	81	137
135	2	3	1	100	101	9	8	17	65	138
136	2	3	2	100	148	8	10	57	80	326
137	2	3	2	100	100	10	10	22	73	160
139	2	3	3	100	153	9	10	21	93	140
Exposure					128	6	2	1	2	8
64	3	NR	NR	128	111	7	14	24	81	140
66	3	1	NR	128	102	7	12	20	95	141
67	3	1	1	128	114	8	11	22	77	184
68	3	1	2	128	246	13	13	21	80	133
69	3	2	NR	128	105	6	8	17	91	144
70	3	2	1	128	154	8	12	112	83	657
Exposure					29	4	1	2	6	13
179	Control	--	--	29	26	5	5	2	14	15
180	Control	--	--	29	36	7	13	4	57	25
181	Control	--	--	29	31	7	6	2	18	16
182	Control	--	--	29	23	12	9	3	15	14
183	Control	--	--	29	23	5	3	1	7	10
184	Control	--	--	29	28	5	2	1	14	9
185	Control	--	--	29	31	8	4	2	8	19

As can be seen, MES is generally still absorbed on the samplers at good efficiency when compared to unused samplers. What is more unusual is an apparent loss of limonene and undecane that were in high concentration on the Wear Cycle Two and Three samplers. It should be noted, however, that the loss is minmal for the samplers that were on the control board – that is, the amounts compare reasonably well. The cause of this is not known. The samplers were held at ambient temperatures during storage, which, because of problems with the dosing and

analytical equipment, was approximately two months. Nevertheless, this suggests that the absorption process on the Tenax is more physical absorption than chemical, which means that the ability of the Tenax to hold these materials is not as strong as first thought.

In addition, two of the armbands used in the field were loaded with a Gore sampler and exposed at the same time as control samplers. The results are shown in Table 4.5-2.

Table 4.6 Armband Exposure

Type	MES (ng)	Benzene (ng)	Ethyl Benzene (ng)	Trichloro Ethylene (ng)	Trimethyl Benzene (ng)	Limonene (ng)	Undecane (ng)	DDVP (ng)
CNTL	32	6	2	0	1	2	8	0
Band	9	20	13	5	11	9	23	4
CNTL	14	6	4	0	1	15	22	0
Band	11	8	3	0	1	2	10	0

These results suggest that the armband contributes a small but significant amount of material to the sampler loading. It should be noted that the armbands used here were new; whether or not these substances would off-gas out to non-detect levels over time is difficult to state.

4.6 VARIATIONS FROM TEST PLAN

The original goal of this project was to analyze immediately upon receipt. However, due to several problems with the ATD/GC-MSD system and problems with generating the required post-exposure spike concentrations there were some delays in analysis of samples. Table 4.7 indicates the planned and actual analysis periods for samplers. During the storage period, they were held at ambient indoor conditions. Figures 4.3 and 4.4 show the temperature and RH for the storage duration.

Table 4.7 Actual Test Schedule Dates

Type	Deployed	Retrieved	Lab Receipt	Analysis Complete
Wear Cycle 1	April 3	April 9	April 12	April 30
Wear Cycle 2	Apr 9	Apr 10	April 12	April 30
Wear Cycle 3	April 10	April 12	April 13	April 30
Control	Apr. 9	Apr. 12	Apr. 17	May 15
Post Exposure	As per Wear Cycle			July 2

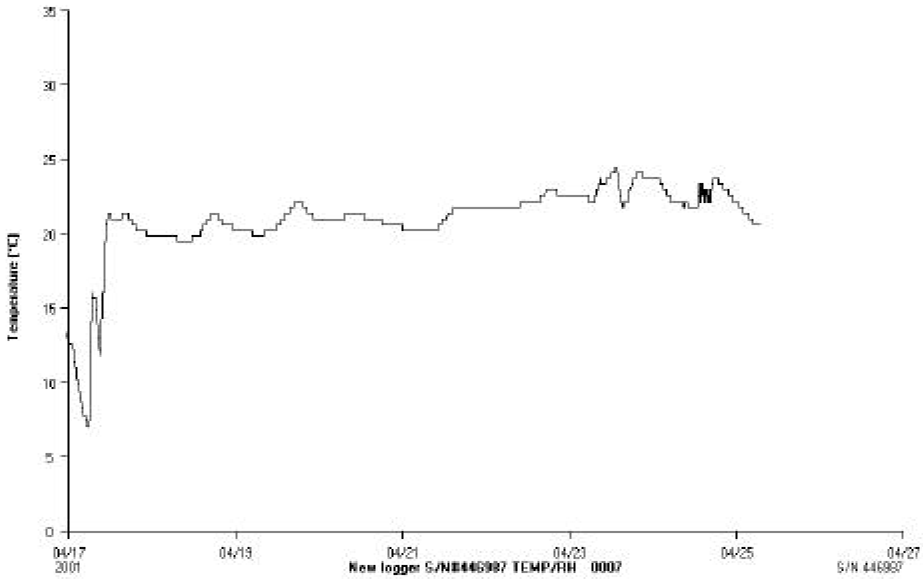

Figure 4.3 Temperature for the Storage Duration

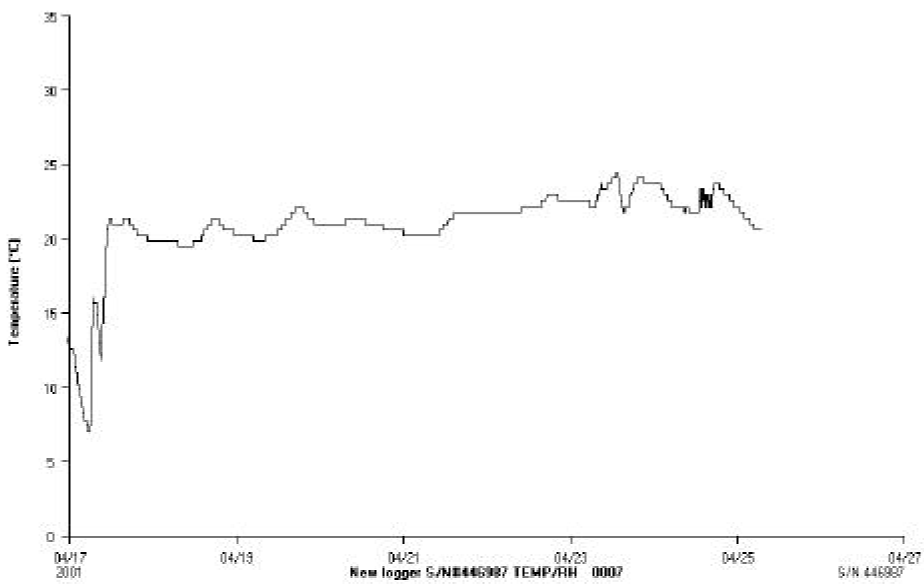

Figure 4.4 Relative Humidity for the Storage Duration

5.0 DISCUSSION OF RESULTS

The results show some interesting trends and variations. The pre-exposure spiked samples show a loss of MES from the samplers that were loaded before deployment on the order of 50 to 75 percent. These losses were, with two exceptions, from samplers dosed in Group A ("old GoreSorbers®). The analysis of the loading of the Group A control samplers immediately after spiking showed an average loading of 621 ng with a deviation of 155 ng. This is very high variability when compared with agent spiking done with a similar chamber earlier this year. A number of samplers are present where the MES loss is between one and two deviations below the average pre-deployment loading. Whether this represents reverse diffusion, breakdown of the material on the samplers, or some other effect is not certain. However, the relative standard deviation of post-exposure concentrations for both the GoreSorbers and the SKC samplers on the control board is less than 8 percent, which may indicate an analysis problem on the samplers analyzed during pre-exposure.

MES is also present on samplers that should have been nominally clean. There are several possible explanations. For instance, MES is commonly used in a variety of personal products (Altoid mints and Ben-Gay rub are two primary examples) and the MES present may be from the usage of these products. Another possibility is that there was cross contamination of the samplers during transportation or deployment due to off-gassing of the samplers in high heat or high humidity situations. This second hypothesis is highly unlikely because each sampler was individually packaged in a glass container with a Teflon®-lined lid before it was placed in a box.

Samplers in all three wear cycles gained between 5 and 20 ng of MES per day of use. In addition, , the control samplers, which were in a static position in the field exercise area, also gained MES, although at a lower rate.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on these trials, MES concentrations on the badge appear to vary from pre-exposure to post-exposure by over 50%. However, the MES variation after exposure between control-board badges that were pre-exposed appears to vary only 5-8 percent. This potential problem

should be investigated more fully or another simulant, including deuterated MES, should be evaluated.

More data have been obtained on environmental levels of potential toxic industrial compounds (TICs) that are being evaluated in the program. These data should be evaluated more fully to determine likely levels of exposure.

Appendix A

Data Logger Data

Date And Time	Temperature (° C)	RH (%)
4/8/01 0:01	23.24	40.7
4/8/01 0:03	23.24	40.7
4/8/01 0:05	23.24	40.7
4/8/01 0:07	23.24	40.7
4/8/01 0:09	23.24	40.7
4/8/01 0:11	23.24	40.7
4/8/01 0:13	23.24	40.7
4/8/01 0:15	23.24	40.7
4/8/01 0:17	23.24	40.7
4/8/01 0:19	23.24	40.7
4/8/01 0:21	23.24	40.7
4/8/01 0:23	23.24	40.7
4/8/01 0:25	23.24	40.7
4/8/01 0:27	23.24	40.7
4/8/01 0:29	23.24	40.7
4/8/01 0:31	23.24	40.7
4/8/01 0:33	23.24	40.7
4/8/01 0:35	23.24	40.7
4/8/01 0:37	23.24	40.7
4/8/01 0:39	23.24	40.7
4/8/01 0:41	23.24	40.7
4/8/01 0:43	23.24	40.7
4/8/01 0:45	23.24	40.7
4/8/01 0:47	23.24	40.7
4/8/01 0:49	23.24	40.7
4/8/01 0:51	23.24	40.7
4/8/01 0:53	23.24	40.7
4/8/01 0:55	23.24	40.7
4/8/01 0:57	23.24	40.7
4/8/01 0:59	23.24	40.7
4/8/01 1:01	23.24	40.7
4/8/01 1:03	23.24	40.7
4/8/01 1:05	23.24	40.7
4/8/01 1:07	23.24	40.7
4/8/01 1:09	23.24	40.7
4/8/01 1:11	23.24	40.7
4/8/01 1:13	23.24	40.7
4/8/01 1:15	23.24	40.7
4/8/01 1:17	23.24	40.2
4/8/01 1:19	23.24	40.2
4/8/01 1:21	23.24	40.2
4/8/01 1:23	23.24	40.2
4/8/01 1:25	23.24	40.2
4/8/01 1:27	23.24	40.7
4/8/01 1:29	23.24	40.7
4/8/01 1:31	23.24	40.7
4/8/01 1:33	23.24	40.2

Date And Time	Temperature (° C)	RH (%)
4/8/01 1:35	23.24	40.2
4/8/01 1:37	23.24	40.2
4/8/01 1:39	23.24	40.2
4/8/01 1:41	23.24	40.2
4/8/01 1:43	23.24	40.2
4/8/01 1:45	23.24	40.7
4/8/01 1:47	23.24	40.2
4/8/01 1:49	23.24	40.2
4/8/01 1:51	23.24	40.2
4/8/01 1:53	23.24	40.2
4/8/01 1:55	23.24	40.2
4/8/01 1:57	23.24	40.2
4/8/01 1:59	23.24	40.2
4/8/01 2:01	23.24	40.2
4/8/01 2:03	23.24	40.2
4/8/01 2:05	23.24	40.2
4/8/01 2:07	22.86	40.2
4/8/01 2:09	23.24	40.2
4/8/01 2:11	22.86	40.2
4/8/01 2:13	22.86	40.2
4/8/01 2:15	22.86	40.2
4/8/01 2:17	22.86	40.2
4/8/01 2:19	22.86	40.2
4/8/01 2:21	22.86	40.2
4/8/01 2:23	22.86	40.7
4/8/01 2:25	22.86	40.7
4/8/01 2:27	22.86	40.7
4/8/01 2:29	22.86	40.7
4/8/01 2:31	22.86	40.7
4/8/01 2:33	22.86	40.7
4/8/01 2:35	22.86	40.7
4/8/01 2:37	22.86	40.7
4/8/01 2:39	22.86	40.7
4/8/01 2:41	22.86	40.7
4/8/01 2:43	22.86	40.7
4/8/01 2:45	22.86	40.7
4/8/01 2:47	22.86	40.7
4/8/01 2:49	22.86	40.2
4/8/01 2:51	22.86	40.7
4/8/01 2:53	22.86	40.7
4/8/01 2:55	22.86	40.7
4/8/01 2:57	22.86	40.7
4/8/01 2:59	22.86	40.7
4/8/01 3:01	22.86	40.7
4/8/01 3:03	22.86	40.7
4/8/01 3:05	22.86	40.7
4/8/01 3:07	22.86	40.7
4/8/01 3:09	22.86	40.7
4/8/01 3:11	22.86	40.2
4/8/01 3:13	22.86	40.7

Date And Time	Temperature (° C)	RH (%)
4/8/01 3:15	22.86	40.7
4/8/01 3:17	22.86	40.7
4/8/01 3:19	22.86	40.7
4/8/01 3:21	22.86	40.7
4/8/01 3:23	22.86	40.7
4/8/01 3:25	22.86	40.2
4/8/01 3:27	22.86	40.2
4/8/01 3:29	22.86	40.2
4/8/01 3:31	22.86	40.2
4/8/01 3:33	22.86	40.2
4/8/01 3:35	22.86	40.7
4/8/01 3:37	22.86	40.7
4/8/01 3:39	22.86	40.2
4/8/01 3:41	22.86	40.2
4/8/01 3:43	22.86	40.2
4/8/01 3:45	22.86	40.2
4/8/01 3:47	22.86	40.2
4/8/01 3:49	22.86	40.2
4/8/01 3:51	22.86	40.2
4/8/01 3:53	22.86	40.7
4/8/01 3:55	22.86	40.2
4/8/01 3:57	22.86	40.2
4/8/01 3:59	22.86	40.2
4/8/01 4:01	22.86	40.2
4/8/01 4:03	22.86	40.2
4/8/01 4:05	22.86	40.2
4/8/01 4:07	22.86	40.2
4/8/01 4:09	22.86	40.2
4/8/01 4:11	22.86	40.2
4/8/01 4:13	22.86	40.2
4/8/01 4:15	22.48	40.7
4/8/01 4:17	22.48	40.2
4/8/01 4:19	22.48	40.2
4/8/01 4:21	22.48	40.2
4/8/01 4:23	22.48	40.2
4/8/01 4:25	22.48	40.2
4/8/01 4:27	22.48	40.2
4/8/01 4:29	22.48	40.2
4/8/01 4:31	22.48	40.2
4/8/01 4:33	22.48	40.7
4/8/01 4:35	22.48	40.7
4/8/01 4:37	22.48	40.7
4/8/01 4:39	22.48	40.7
4/8/01 4:41	22.48	40.7
4/8/01 4:43	22.48	40.7
4/8/01 4:45	22.48	40.7
4/8/01 4:47	22.48	40.7
4/8/01 4:49	22.48	40.7
4/8/01 4:51	22.48	40.7
4/8/01 4:53	22.48	40.7

Date And Time	Temperature (° C)	RH (%)
4/8/01 4:55	22.48	40.7
4/8/01 4:57	22.48	40.7
4/8/01 4:59	22.48	40.7
4/8/01 5:01	22.48	40.7
4/8/01 5:03	22.48	40.7
4/8/01 5:05	22.48	40.7
4/8/01 5:07	22.48	40.7
4/8/01 5:09	22.48	40.7
4/8/01 5:11	22.48	40.7
4/8/01 5:13	22.48	40.7
4/8/01 5:15	22.48	40.7
4/8/01 5:17	22.48	40.7
4/8/01 5:19	22.48	40.7
4/8/01 5:21	22.48	40.7
4/8/01 5:23	22.48	40.7
4/8/01 5:25	22.48	40.7
4/8/01 5:27	22.48	40.7
4/8/01 5:29	22.48	40.7
4/8/01 5:31	22.48	40.7
4/8/01 5:33	22.48	40.7
4/8/01 5:35	22.48	40.7
4/8/01 5:37	22.48	40.7
4/8/01 5:39	22.48	40.7
4/8/01 5:41	22.48	40.7
4/8/01 5:43	22.48	40.7
4/8/01 5:45	22.48	40.7
4/8/01 5:47	22.48	40.7
4/8/01 5:49	22.48	40.7
4/8/01 5:51	22.48	40.7
4/8/01 5:53	22.48	40.7
4/8/01 5:55	22.48	40.7
4/8/01 5:57	22.48	40.7
4/8/01 5:59	22.48	40.7
4/8/01 6:01	22.48	40.7
4/8/01 6:03	22.48	40.7
4/8/01 6:05	22.48	40.7
4/8/01 6:07	22.48	40.7
4/8/01 6:09	22.48	40.7
4/8/01 6:11	22.48	40.7
4/8/01 6:13	22.48	40.7
4/8/01 6:15	22.09	40.7
4/8/01 6:17	22.09	40.7
4/8/01 6:19	22.09	40.7
4/8/01 6:21	22.09	40.7
4/8/01 6:23	22.09	40.7
4/8/01 6:25	22.09	40.7
4/8/01 6:27	22.09	40.7
4/8/01 6:29	22.09	40.2
4/8/01 6:31	22.09	40.2
4/8/01 6:33	22.09	40.7

Date And Time	Temperature (° C)	RH (%)
4/8/01 6:35	22.09	40.7
4/8/01 6:37	22.09	40.7
4/8/01 6:39	22.09	40.7
4/8/01 6:41	22.09	40.7
4/8/01 6:43	22.09	41.2
4/8/01 6:45	22.09	40.7
4/8/01 6:47	22.09	40.7
4/8/01 6:49	22.09	40.7
4/8/01 6:51	22.09	41.2
4/8/01 6:53	22.09	41.2
4/8/01 6:55	22.09	41.2
4/8/01 6:57	22.09	40.7
4/8/01 6:59	22.09	40.7
4/8/01 7:01	22.09	40.7
4/8/01 7:03	22.09	40.7
4/8/01 7:05	22.09	40.7
4/8/01 7:07	22.09	40.7
4/8/01 7:09	22.09	41.2
4/8/01 7:11	22.09	40.7
4/8/01 7:13	22.09	40.7
4/8/01 7:15	22.09	40.7
4/8/01 7:17	22.09	40.7
4/8/01 7:19	22.09	40.7
4/8/01 7:21	22.09	40.7
4/8/01 7:23	22.09	40.7
4/8/01 7:25	22.09	40.7
4/8/01 7:27	22.09	40.7
4/8/01 7:29	22.09	40.7
4/8/01 7:31	22.09	40.7
4/8/01 7:33	22.09	40.7
4/8/01 7:35	22.09	40.7
4/8/01 7:37	22.09	40.7
4/8/01 7:39	22.09	40.7
4/8/01 7:41	22.09	40.7
4/8/01 7:43	22.09	40.7
4/8/01 7:45	22.09	40.7
4/8/01 7:47	22.09	40.7
4/8/01 7:49	22.09	40.7
4/8/01 7:51	22.09	40.7
4/8/01 7:53	22.09	40.7
4/8/01 7:55	22.09	40.7
4/8/01 7:57	22.09	40.7
4/8/01 7:59	22.09	40.7
4/8/01 8:01	22.09	40.7
4/8/01 8:03	22.09	40.7
4/8/01 8:05	22.09	40.7
4/8/01 8:07	22.09	41.2
4/8/01 8:09	22.09	41.2
4/8/01 8:11	22.09	40.7
4/8/01 8:13	22.09	41.2

Date And Time	Temperature (° C)	RH (%)
4/8/01 8:15	22.09	41.2
4/8/01 8:17	22.09	41.2
4/8/01 8:19	22.09	41.2
4/8/01 8:21	22.09	41.2
4/8/01 8:23	22.09	41.2
4/8/01 8:25	22.09	41.2
4/8/01 8:27	22.09	41.2
4/8/01 8:29	22.09	41.2
4/8/01 8:31	22.09	41.7
4/8/01 8:33	22.09	41.2
4/8/01 8:35	22.09	41.7
4/8/01 8:37	22.09	41.7
4/8/01 8:39	22.09	41.7
4/8/01 8:41	22.09	41.7
4/8/01 8:43	22.09	41.7
4/8/01 8:45	22.09	41.7
4/8/01 8:47	22.09	42.2
4/8/01 8:49	22.09	42.2
4/8/01 8:51	22.09	42.2
4/8/01 8:53	22.09	42.2
4/8/01 8:55	22.09	42.2
4/8/01 8:57	22.09	42.2
4/8/01 8:59	22.09	42.2
4/8/01 9:01	22.09	42.2
4/8/01 9:03	22.09	42.2
4/8/01 9:05	22.09	42.2
4/8/01 9:07	22.09	42.7
4/8/01 9:09	22.09	42.7
4/8/01 9:11	22.09	42.7
4/8/01 9:13	22.09	42.2
4/8/01 9:15	22.09	42.7
4/8/01 9:17	22.09	42.7
4/8/01 9:19	22.09	42.7
4/8/01 9:21	22.09	42.7
4/8/01 9:23	22.09	43.2
4/8/01 9:25	22.09	43.2
4/8/01 9:27	22.09	43.2
4/8/01 9:29	22.09	43.2
4/8/01 9:31	22.09	43.2
4/8/01 9:33	22.09	43.2
4/8/01 9:35	22.09	43.2
4/8/01 9:37	22.09	43.2
4/8/01 9:39	22.09	43.2
4/8/01 9:41	22.09	43.2
4/8/01 9:43	22.09	43.2
4/8/01 9:45	22.09	43.2
4/8/01 9:47	22.09	43.2
4/8/01 9:49	22.48	43.2
4/8/01 9:51	22.48	43.2
4/8/01 9:53	22.48	43.2

Date And Time	Temperature (° C)	RH (%)
4/8/01 9:55	22.48	43.2
4/8/01 9:57	22.48	43.2
4/8/01 9:59	22.48	43.8
4/8/01 10:01	22.48	43.8
4/8/01 10:03	22.48	43.8
4/8/01 10:05	22.48	43.8
4/8/01 10:07	22.48	43.8
4/8/01 10:09	22.48	43.8
4/8/01 10:11	22.48	43.8
4/8/01 10:13	22.48	44.3
4/8/01 10:15	22.48	44.3
4/8/01 10:17	22.48	43.8
4/8/01 10:19	22.48	44.3
4/8/01 10:21	22.48	44.3
4/8/01 10:23	22.48	44.3
4/8/01 10:25	22.48	44.3
4/8/01 10:27	22.48	44.3
4/8/01 10:29	22.48	44.3
4/8/01 10:31	22.48	44.8
4/8/01 10:33	22.48	44.8
4/8/01 10:35	22.48	44.8
4/8/01 10:37	22.48	44.8
4/8/01 10:39	22.48	44.8
4/8/01 10:41	22.48	44.8
4/8/01 10:43	22.48	44.8
4/8/01 10:45	22.48	44.8
4/8/01 10:47	22.48	44.8
4/8/01 10:49	22.48	44.8
4/8/01 10:51	22.48	45.3
4/8/01 10:53	22.48	45.3
4/8/01 10:55	22.48	45.3
4/8/01 10:57	22.48	45.3
4/8/01 10:59	22.48	45.3
4/8/01 11:01	22.48	45.3
4/8/01 11:03	22.48	45.3
4/8/01 11:05	22.48	45.3
4/8/01 11:07	22.48	45.3
4/8/01 11:09	22.48	45.3
4/8/01 11:11	22.48	45.8
4/8/01 11:13	22.86	45.8
4/8/01 11:15	22.86	45.8
4/8/01 11:17	22.86	45.8
4/8/01 11:19	22.86	45.8
4/8/01 11:21	22.86	45.8
4/8/01 11:23	22.86	45.3
4/8/01 11:25	22.86	45.3
4/8/01 11:27	22.86	45.3
4/8/01 11:29	22.86	45.3
4/8/01 11:31	22.86	45.3
4/8/01 11:33	22.86	45.8

Date And Time	Temperature (° C)	RH (%)
4/8/01 11:35	22.86	45.8
4/8/01 11:37	22.86	45.8
4/8/01 11:39	22.86	45.8
4/8/01 11:41	22.86	45.8
4/8/01 11:43	22.86	45.8
4/8/01 11:45	22.86	45.8
4/8/01 11:47	22.86	45.8
4/8/01 11:49	22.86	45.8
4/8/01 11:51	22.86	45.8
4/8/01 11:53	22.86	45.8
4/8/01 11:55	22.86	45.8
4/8/01 11:57	22.86	46.3
4/8/01 11:59	22.86	46.3
4/8/01 12:01	22.86	46.3
4/8/01 12:03	22.86	46.3
4/8/01 12:05	22.86	46.3
4/8/01 12:07	22.86	46.3
4/8/01 12:09	22.86	46.3
4/8/01 12:11	22.86	46.3
4/8/01 12:13	22.86	46.3
4/8/01 12:15	22.86	46.3
4/8/01 12:17	22.86	46.3
4/8/01 12:19	22.86	46.3
4/8/01 12:21	22.86	46.3
4/8/01 12:23	22.86	46.3
4/8/01 12:25	22.86	45.8
4/8/01 12:27	22.86	46.3
4/8/01 12:29	22.86	46.3
4/8/01 12:31	22.86	46.3
4/8/01 12:33	22.86	46.3
4/8/01 12:35	22.86	46.3
4/8/01 12:37	22.86	46.3
4/8/01 12:39	22.86	46.3
4/8/01 12:41	22.86	46.3
4/8/01 12:43	22.86	46.3
4/8/01 12:45	23.24	46.3
4/8/01 12:47	23.24	46.3
4/8/01 12:49	23.24	46.3
4/8/01 12:51	23.24	46.3
4/8/01 12:53	23.24	46.3
4/8/01 12:55	23.24	46.3
4/8/01 12:57	23.24	46.3
4/8/01 12:59	23.24	46.3
4/8/01 13:01	23.24	46.3
4/8/01 13:03	23.24	46.3
4/8/01 13:05	23.24	46.3
4/8/01 13:07	23.24	45.8
4/8/01 13:09	23.24	45.8
4/8/01 13:11	23.24	45.8
4/8/01 13:13	23.24	45.8

Date And Time	Temperature (° C)	RH (%)
4/8/01 13:15	23.24	45.8
4/8/01 13:17	23.24	45.8
4/8/01 13:19	23.24	45.8
4/8/01 13:21	23.24	45.8
4/8/01 13:23	23.24	45.8
4/8/01 13:25	23.24	45.8
4/8/01 13:27	23.24	45.8
4/8/01 13:29	23.24	45.8
4/8/01 13:31	23.24	45.8
4/8/01 13:33	23.24	45.8
4/8/01 13:35	23.24	45.8
4/8/01 13:37	23.24	45.8
4/8/01 13:39	23.24	45.8
4/8/01 13:41	23.24	45.8
4/8/01 13:43	23.24	45.8
4/8/01 13:45	23.24	45.8
4/8/01 13:47	23.24	45.8
4/8/01 13:49	23.24	45.8
4/8/01 13:51	23.24	45.8
4/8/01 13:53	23.24	45.8
4/8/01 13:55	23.24	45.8
4/8/01 13:57	23.24	45.8
4/8/01 13:59	23.24	45.8
4/8/01 14:01	23.24	45.8
4/8/01 14:03	23.24	45.8
4/8/01 14:05	23.24	45.8
4/8/01 14:07	23.24	45.8
4/8/01 14:09	23.24	45.8
4/8/01 14:11	23.24	45.8
4/8/01 14:13	23.24	45.8
4/8/01 14:15	23.24	45.8
4/8/01 14:17	23.24	45.8
4/8/01 14:19	23.24	45.8
4/8/01 14:21	23.24	45.8
4/8/01 14:23	23.24	45.8
4/8/01 14:25	23.24	45.8
4/8/01 14:27	23.24	45.3
4/8/01 14:29	23.24	45.3
4/8/01 14:31	23.24	45.3
4/8/01 14:33	23.24	45.8
4/8/01 14:35	23.24	45.8
4/8/01 14:37	23.24	45.8
4/8/01 14:39	23.24	45.8
4/8/01 14:41	23.24	45.8
4/8/01 14:43	23.24	45.8
4/8/01 14:45	23.24	45.8
4/8/01 14:47	23.24	45.3
4/8/01 14:49	23.24	45.3
4/8/01 14:51	23.24	45.3
4/8/01 14:53	23.24	45.3

Date And Time	Temperature (º C)	RH (%)
4/8/01 14:55	23.24	45.3
4/8/01 14:57	23.24	45.3
4/8/01 14:59	23.24	45.3
4/8/01 15:01	23.24	45.3
4/8/01 15:03	23.24	45.3
4/8/01 15:05	23.24	45.3
4/8/01 15:07	23.24	45.3
4/8/01 15:09	23.24	45.3
4/8/01 15:11	23.24	45.3
4/8/01 15:13	23.24	45.3
4/8/01 15:15	23.24	45.3
4/8/01 15:17	23.24	45.3
4/8/01 15:19	23.24	45.3
4/8/01 15:21	23.24	45.3
4/8/01 15:23	23.24	45.3
4/8/01 15:25	23.24	45.3
4/8/01 15:27	23.24	45.3
4/8/01 15:29	23.24	45.3
4/8/01 15:31	23.24	44.8
4/8/01 15:33	23.24	44.8
4/8/01 15:35	23.24	44.8
4/8/01 15:37	23.24	45.3
4/8/01 15:39	23.24	44.8
4/8/01 15:41	23.24	44.8
4/8/01 15:43	23.24	44.8
4/8/01 15:45	23.24	44.8
4/8/01 15:47	23.24	44.8
4/8/01 15:49	23.24	44.8
4/8/01 15:51	23.24	44.8
4/8/01 15:53	23.24	44.8
4/8/01 15:55	23.24	44.8
4/8/01 15:57	23.24	44.8
4/8/01 15:59	23.24	44.8
4/8/01 16:01	23.24	44.8
4/8/01 16:03	23.24	44.8
4/8/01 16:05	23.24	44.8
4/8/01 16:07	23.24	44.8
4/8/01 16:09	23.24	44.8
4/8/01 16:11	23.24	44.8
4/8/01 16:13	23.24	44.8
4/8/01 16:15	23.24	44.8
4/8/01 16:17	23.24	44.8
4/8/01 16:19	23.24	44.8
4/8/01 16:21	23.24	44.8
4/8/01 16:23	23.24	44.8
4/8/01 16:25	23.24	44.8
4/8/01 16:27	23.24	44.8
4/8/01 16:29	23.24	44.8
4/8/01 16:31	23.24	44.8
4/8/01 16:33	23.24	44.8

Date And Time	Temperature (° C)	RH (%)
4/8/01 16:35	23.63	44.8
4/8/01 16:37	23.63	44.8
4/8/01 16:39	23.63	44.8
4/8/01 16:41	23.63	44.3
4/8/01 16:43	23.63	44.3
4/8/01 16:45	23.63	44.3
4/8/01 16:47	23.63	44.3
4/8/01 16:49	23.63	44.3
4/8/01 16:51	23.63	44.3
4/8/01 16:53	23.63	44.3
4/8/01 16:55	23.63	44.3
4/8/01 16:57	23.24	44.3
4/8/01 16:59	23.63	44.3
4/8/01 17:01	23.63	44.3
4/8/01 17:03	23.63	43.8
4/8/01 17:05	23.63	44.3
4/8/01 17:07	23.63	44.3
4/8/01 17:09	23.63	44.3
4/8/01 17:11	23.63	44.3
4/8/01 17:13	23.63	44.3
4/8/01 17:15	23.63	44.3
4/8/01 17:17	23.63	44.3
4/8/01 17:19	23.63	44.3
4/8/01 17:21	23.63	44.3
4/8/01 17:23	23.63	44.3
4/8/01 17:25	23.63	44.3
4/8/01 17:27	23.63	44.3
4/8/01 17:29	23.63	43.8
4/8/01 17:31	23.63	43.8
4/8/01 17:33	23.63	43.8
4/8/01 17:35	23.63	43.8
4/8/01 17:37	23.63	43.8
4/8/01 17:39	23.63	43.8
4/8/01 17:41	23.63	43.8
4/8/01 17:43	23.63	43.8
4/8/01 17:45	23.63	43.2
4/8/01 17:47	23.63	43.8
4/8/01 17:49	23.24	43.8
4/8/01 17:51	23.63	43.8
4/8/01 17:53	23.63	43.8
4/8/01 17:55	23.63	43.8
4/8/01 17:57	23.63	43.8
4/8/01 17:59	23.63	43.8
4/8/01 18:01	23.63	43.8
4/8/01 18:03	23.63	43.8
4/8/01 18:05	23.63	43.8
4/8/01 18:07	23.63	43.8
4/8/01 18:09	23.63	43.8
4/8/01 18:11	23.63	43.8
4/8/01 18:13	23.63	43.8

Date And Time	Temperature (º C)	RH (%)
4/8/01 18:15	23.63	43.8
4/8/01 18:17	23.63	43.8
4/8/01 18:19	23.63	43.8
4/8/01 18:21	23.63	43.8
4/8/01 18:23	23.63	43.8
4/8/01 18:25	23.63	43.2
4/8/01 18:27	23.63	43.2
4/8/01 18:29	23.63	43.2
4/8/01 18:31	23.63	43.2
4/8/01 18:33	23.24	43.2
4/8/01 18:35	23.24	43.2
4/8/01 18:37	23.24	43.2
4/8/01 18:39	23.24	43.2
4/8/01 18:41	23.24	43.2
4/8/01 18:43	23.24	43.2
4/8/01 18:45	23.24	43.2
4/8/01 18:47	23.24	43.2
4/8/01 18:49	23.24	43.2
4/8/01 18:51	23.24	43.2
4/8/01 18:53	23.24	43.2
4/8/01 18:55	23.24	43.2
4/8/01 18:57	23.24	43.2
4/8/01 18:59	23.24	43.2
4/8/01 19:01	23.24	43.2
4/8/01 19:03	23.24	43.2
4/8/01 19:05	23.24	43.2
4/8/01 19:07	23.24	43.2
4/8/01 19:09	23.24	43.2
4/8/01 19:11	23.24	43.2
4/8/01 19:13	23.24	43.2
4/8/01 19:15	23.24	43.2
4/8/01 19:17	23.24	43.2
4/8/01 19:19	23.24	43.2
4/8/01 19:21	23.24	43.2
4/8/01 19:23	23.24	43.2
4/8/01 19:25	23.24	43.2
4/8/01 19:27	23.24	43.2
4/8/01 19:29	23.24	43.2
4/8/01 19:31	23.24	43.2
4/8/01 19:33	23.24	43.2
4/8/01 19:35	23.24	43.2
4/8/01 19:37	23.24	42.7
4/8/01 19:39	23.24	42.7
4/8/01 19:41	23.24	42.7
4/8/01 19:43	23.24	42.7
4/8/01 19:45	23.24	42.7
4/8/01 19:47	23.24	42.7
4/8/01 19:49	23.24	42.7
4/8/01 19:51	23.24	42.7
4/8/01 19:53	23.24	42.7

Date And Time	Temperature (° C)	RH (%)
4/8/01 19:55	23.24	42.7
4/8/01 19:57	23.24	42.7
4/8/01 19:59	23.24	42.7
4/8/01 20:01	23.24	42.7
4/8/01 20:03	23.24	42.7
4/8/01 20:05	23.24	42.7
4/8/01 20:07	23.24	42.7
4/8/01 20:09	23.24	42.7
4/8/01 20:11	23.24	42.7
4/8/01 20:13	23.24	42.7
4/8/01 20:15	23.24	42.7
4/8/01 20:17	23.24	42.7
4/8/01 20:19	23.24	42.7
4/8/01 20:21	23.24	42.7
4/8/01 20:23	23.24	42.7
4/8/01 20:25	23.24	42.7
4/8/01 20:27	23.24	42.7
4/8/01 20:29	23.24	42.7
4/8/01 20:31	23.24	42.7
4/8/01 20:33	23.24	42.7
4/8/01 20:35	23.24	42.7
4/8/01 20:37	23.24	42.7
4/8/01 20:39	23.24	42.7
4/8/01 20:41	23.24	42.7
4/8/01 20:43	23.24	42.7
4/8/01 20:45	23.24	42.7
4/8/01 20:47	23.24	42.7
4/8/01 20:49	23.24	42.7
4/8/01 20:51	23.24	42.7
4/8/01 20:53	23.24	42.7
4/8/01 20:55	23.24	42.7
4/8/01 20:57	23.24	42.7
4/8/01 20:59	23.24	42.7
4/8/01 21:01	23.24	42.7
4/8/01 21:03	23.24	42.7
4/8/01 21:05	23.24	42.7
4/8/01 21:07	23.24	42.7
4/8/01 21:09	23.24	42.7
4/8/01 21:11	23.24	42.7
4/8/01 21:13	23.24	42.7
4/8/01 21:15	23.24	42.7
4/8/01 21:17	23.24	42.7
4/8/01 21:19	23.24	42.7
4/8/01 21:21	23.24	42.2
4/8/01 21:23	23.24	42.7
4/8/01 21:25	23.24	42.2
4/8/01 21:27	23.24	42.2
4/8/01 21:29	23.24	42.2
4/8/01 21:31	23.24	42.2
4/8/01 21:33	23.24	42.2

Date And Time	Temperature (° C)	RH (%)
4/8/01 21:35	23.24	42.2
4/8/01 21:37	23.24	42.2
4/8/01 21:39	23.24	42.2
4/8/01 21:41	23.24	42.2
4/8/01 21:43	23.24	42.2
4/8/01 21:45	23.24	42.2
4/8/01 21:47	23.24	42.2
4/8/01 21:49	23.24	42.2
4/8/01 21:51	23.24	42.2
4/8/01 21:53	23.24	42.2
4/8/01 21:55	23.24	42.2
4/8/01 21:57	23.24	42.2
4/8/01 21:59	23.24	42.2
4/8/01 22:01	23.24	42.2
4/8/01 22:03	23.24	42.2
4/8/01 22:05	23.24	42.2
4/8/01 22:07	23.24	42.2
4/8/01 22:09	23.24	42.2
4/8/01 22:11	23.24	42.2
4/8/01 22:13	23.24	42.2
4/8/01 22:15	23.24	42.2
4/8/01 22:17	23.24	42.2
4/8/01 22:19	23.24	42.2
4/8/01 22:21	23.24	42.2
4/8/01 22:23	23.24	42.2
4/8/01 22:25	23.24	42.2
4/8/01 22:27	23.24	42.2
4/8/01 22:29	23.24	42.2
4/8/01 22:31	23.24	42.2
4/8/01 22:33	23.24	42.2
4/8/01 22:35	23.24	42.2
4/8/01 22:37	23.24	42.2
4/8/01 22:39	23.24	42.2
4/8/01 22:41	23.24	42.2
4/8/01 22:43	23.24	42.2
4/8/01 22:45	23.24	42.2
4/8/01 22:47	23.24	41.7
4/8/01 22:49	23.24	41.7
4/8/01 22:51	23.24	41.7
4/8/01 22:53	23.24	41.7
4/8/01 22:55	23.24	41.7
4/8/01 22:57	23.24	41.7
4/8/01 22:59	23.24	41.7
4/8/01 23:01	23.24	41.7
4/8/01 23:03	23.24	41.7
4/8/01 23:05	23.24	42.2
4/8/01 23:07	23.24	41.7
4/8/01 23:09	23.24	41.7
4/8/01 23:11	23.24	41.7
4/8/01 23:13	23.24	41.7

Date And Time	Temperature (° C)	RH (%)
4/8/01 23:15	23.24	41.7
4/8/01 23:17	23.24	41.7
4/8/01 23:19	23.24	41.7
4/8/01 23:21	23.24	41.7
4/8/01 23:23	23.24	41.7
4/8/01 23:25	23.24	41.7
4/8/01 23:27	23.24	41.7
4/8/01 23:29	23.24	41.7
4/8/01 23:31	23.24	41.7
4/8/01 23:33	23.24	41.7
4/8/01 23:35	22.86	41.7
4/8/01 23:37	22.86	41.7
4/8/01 23:39	22.86	41.7
4/8/01 23:41	22.86	41.7
4/8/01 23:43	22.86	41.7
4/8/01 23:45	22.86	41.7
4/8/01 23:47	22.86	42.2
4/8/01 23:49	22.86	42.2
4/8/01 23:51	22.86	42.2
4/8/01 23:53	22.86	42.2
4/8/01 23:55	22.86	42.2
4/8/01 23:57	22.86	42.2
4/8/01 23:59	22.86	42.2
4/9/01 0:01	22.86	42.2
4/9/01 0:03	22.86	42.2
4/9/01 0:05	22.86	42.2
4/9/01 0:07	22.86	42.2
4/9/01 0:09	22.86	42.2
4/9/01 0:11	22.86	42.2
4/9/01 0:13	22.86	42.2
4/9/01 0:15	22.86	42.2
4/9/01 0:17	22.86	42.2
4/9/01 0:19	22.86	41.7
4/9/01 0:21	22.86	41.7
4/9/01 0:23	22.86	41.7
4/9/01 0:25	22.86	42.2
4/9/01 0:27	22.86	42.2
4/9/01 0:29	22.86	42.2
4/9/01 0:31	22.86	41.7
4/9/01 0:33	22.86	41.7
4/9/01 0:35	22.86	41.7
4/9/01 0:37	22.86	41.7
4/9/01 0:39	22.86	41.7
4/9/01 0:41	22.86	41.7
4/9/01 0:43	22.86	41.7
4/9/01 0:45	22.86	41.7
4/9/01 0:47	22.86	41.7
4/9/01 0:49	22.86	41.7
4/9/01 0:51	22.86	41.7
4/9/01 0:53	22.86	41.7

Date And Time	Temperature (° C)	RH (%)
4/9/01 0:55	22.86	41.7
4/9/01 0:57	22.86	41.7
4/9/01 0:59	22.86	41.7
4/9/01 1:01	22.86	41.7
4/9/01 1:03	22.86	41.7
4/9/01 1:05	22.86	41.7
4/9/01 1:07	22.86	41.7
4/9/01 1:09	22.86	41.7
4/9/01 1:11	22.86	41.7
4/9/01 1:13	22.86	42.2
4/9/01 1:15	22.86	41.7
4/9/01 1:17	22.86	41.7
4/9/01 1:19	22.86	41.7
4/9/01 1:21	22.86	41.7
4/9/01 1:23	22.86	41.7
4/9/01 1:25	22.86	41.7
4/9/01 1:27	22.86	41.7
4/9/01 1:29	22.86	41.7
4/9/01 1:31	22.86	41.7
4/9/01 1:33	22.86	41.7
4/9/01 1:35	22.86	42.2
4/9/01 1:37	22.48	41.7
4/9/01 1:39	22.48	41.7
4/9/01 1:41	22.48	41.7
4/9/01 1:43	22.48	41.7
4/9/01 1:45	22.48	41.7
4/9/01 1:47	22.48	41.7
4/9/01 1:49	22.48	41.7
4/9/01 1:51	22.48	41.7
4/9/01 1:53	22.48	41.7
4/9/01 1:55	22.48	42.2
4/9/01 1:57	22.48	42.2
4/9/01 1:59	22.48	42.2
4/9/01 2:01	22.48	42.2
4/9/01 2:03	22.48	42.2
4/9/01 2:05	22.48	42.2
4/9/01 2:07	22.48	42.2
4/9/01 2:09	22.48	42.2
4/9/01 2:11	22.48	42.2
4/9/01 2:13	22.48	42.2
4/9/01 2:15	22.48	42.2
4/9/01 2:17	22.48	42.2
4/9/01 2:19	22.48	42.2
4/9/01 2:21	22.48	42.2
4/9/01 2:23	22.48	42.2
4/9/01 2:25	22.48	42.2
4/9/01 2:27	22.48	42.2
4/9/01 2:29	22.48	42.2
4/9/01 2:31	22.48	42.2
4/9/01 2:33	22.48	41.7

Date And Time	Temperature (° C)	RH (%)
4/9/01 2:35	22.48	41.7
4/9/01 2:37	22.48	41.7
4/9/01 2:39	22.48	42.2
4/9/01 2:41	22.48	42.2
4/9/01 2:43	22.48	42.2
4/9/01 2:45	22.48	41.7
4/9/01 2:47	22.48	41.7
4/9/01 2:49	22.48	41.7
4/9/01 2:51	22.48	41.7
4/9/01 2:53	22.48	41.7
4/9/01 2:55	22.48	41.7
4/9/01 2:57	22.48	41.7
4/9/01 2:59	22.48	41.7
4/9/01 3:01	22.48	41.7
4/9/01 3:03	22.48	41.7
4/9/01 3:05	22.48	41.7
4/9/01 3:07	22.48	41.7
4/9/01 3:09	22.48	41.7
4/9/01 3:11	22.48	41.7
4/9/01 3:13	22.48	41.7
4/9/01 3:15	22.48	41.7
4/9/01 3:17	22.48	41.7
4/9/01 3:19	22.48	41.7
4/9/01 3:21	22.09	42.2
4/9/01 3:23	22.09	41.7
4/9/01 3:25	22.09	41.7
4/9/01 3:27	22.09	41.7
4/9/01 3:29	22.09	41.7
4/9/01 3:31	22.09	41.7
4/9/01 3:33	22.09	41.7
4/9/01 3:35	22.09	41.7
4/9/01 3:37	22.09	41.7
4/9/01 3:39	22.09	41.7
4/9/01 3:41	22.09	41.7
4/9/01 3:43	22.09	41.7
4/9/01 3:45	22.09	42.2
4/9/01 3:47	22.09	42.2
4/9/01 3:49	22.09	42.2
4/9/01 3:51	22.09	42.2
4/9/01 3:53	22.09	42.2
4/9/01 3:55	22.09	42.2
4/9/01 3:57	22.09	42.2
4/9/01 3:59	22.09	42.2
4/9/01 4:01	22.09	42.2
4/9/01 4:03	22.09	42.2
4/9/01 4:05	22.09	42.2
4/9/01 4:07	22.09	42.2
4/9/01 4:09	22.09	42.2
4/9/01 4:11	22.09	42.2
4/9/01 4:13	22.09	42.2

Date And Time	Temperature (° C)	RH (%)
4/9/01 4:15	22.09	42.2
4/9/01 4:17	22.09	42.2
4/9/01 4:19	22.09	42.2
4/9/01 4:21	22.09	42.2
4/9/01 4:23	22.09	41.7
4/9/01 4:25	22.09	41.7
4/9/01 4:27	22.09	41.7
4/9/01 4:29	22.09	42.2
4/9/01 4:31	22.09	42.2
4/9/01 4:33	22.09	41.7
4/9/01 4:35	22.09	41.7
4/9/01 4:37	22.09	41.7
4/9/01 4:39	22.09	41.7
4/9/01 4:41	22.09	41.7
4/9/01 4:43	22.09	41.7
4/9/01 4:45	22.09	41.7
4/9/01 4:47	22.09	41.7
4/9/01 4:49	22.09	41.7
4/9/01 4:51	22.09	41.7
4/9/01 4:53	22.09	41.7
4/9/01 4:55	22.09	41.7
4/9/01 4:57	22.09	41.7
4/9/01 4:59	21.71	41.7
4/9/01 5:01	21.71	41.7
4/9/01 5:03	21.71	41.7
4/9/01 5:05	21.71	41.7
4/9/01 5:07	21.71	41.7
4/9/01 5:09	21.71	41.7
4/9/01 5:11	21.71	41.7
4/9/01 5:13	21.71	41.7
4/9/01 5:15	21.71	41.7
4/9/01 5:17	21.71	41.7
4/9/01 5:19	21.71	41.7
4/9/01 5:21	21.71	41.7
4/9/01 5:23	21.71	41.7
4/9/01 5:25	21.71	41.7
4/9/01 5:27	21.71	42.2
4/9/01 5:29	21.71	42.2
4/9/01 5:31	21.71	42.2
4/9/01 5:33	21.71	42.2
4/9/01 5:35	21.71	42.2
4/9/01 5:37	21.71	42.2
4/9/01 5:39	21.71	42.2
4/9/01 5:41	21.71	42.2
4/9/01 5:43	21.71	42.2
4/9/01 5:45	21.71	42.2
4/9/01 5:47	21.71	42.2
4/9/01 5:49	21.71	42.2
4/9/01 5:51	21.71	42.2
4/9/01 5:53	21.71	41.7

Date And Time	Temperature (° C)	RH (%)
4/9/01 5:55	21.71	41.7
4/9/01 5:57	21.71	42.2
4/9/01 5:59	21.71	42.2
4/9/01 6:01	21.71	42.7
4/9/01 6:03	21.71	42.2
4/9/01 6:05	21.71	42.2
4/9/01 6:07	21.71	42.2
4/9/01 6:09	21.71	42.2
4/9/01 6:11	21.71	42.2
4/9/01 6:13	21.71	42.2
4/9/01 6:15	21.71	42.7
4/9/01 6:17	21.71	42.7
4/9/01 6:19	21.71	42.7
4/9/01 6:21	21.71	42.7
4/9/01 6:23	21.71	43.2
4/9/01 6:25	21.71	43.2
4/9/01 6:27	21.71	43.2
4/9/01 6:29	21.71	43.2
4/9/01 6:31	21.71	43.8
4/9/01 6:33	21.71	43.8
4/9/01 6:35	21.71	43.8
4/9/01 6:37	21.71	44.3
4/9/01 6:39	21.71	44.3
4/9/01 6:41	21.71	44.8
4/9/01 6:43	21.71	44.8
4/9/01 6:45	21.71	44.8
4/9/01 6:47	21.71	45.8
4/9/01 6:49	21.71	45.8
4/9/01 6:51	21.71	46.3
4/9/01 6:53	21.71	46.3
4/9/01 6:55	21.71	46.3
4/9/01 6:57	21.71	46.3
4/9/01 6:59	21.71	46.8
4/9/01 7:01	21.71	46.8
4/9/01 7:03	21.71	46.8
4/9/01 7:05	21.71	46.8
4/9/01 7:07	22.09	46.8
4/9/01 7:09	22.09	46.8
4/9/01 7:11	22.09	46.8
4/9/01 7:13	22.09	47.4
4/9/01 7:15	22.09	47.4
4/9/01 7:17	22.09	47.4
4/9/01 7:19	22.09	47.4
4/9/01 7:21	22.09	46.8
4/9/01 7:23	22.09	47.4
4/9/01 7:25	22.09	46.8
4/9/01 7:27	22.09	46.8
4/9/01 7:29	22.09	46.8
4/9/01 7:31	22.09	46.8
4/9/01 7:33	22.09	46.8

Date And Time	Temperature (° C)	RH (%)
4/9/01 7:35	22.09	46.8
4/9/01 7:37	22.09	46.3
4/9/01 7:39	22.09	46.8
4/9/01 7:41	22.09	46.8
4/9/01 7:43	22.09	46.8
4/9/01 7:45	22.09	46.8
4/9/01 7:47	22.09	46.3
4/9/01 7:49	22.09	46.3
4/9/01 7:51	22.09	46.3
4/9/01 7:53	22.09	46.3
4/9/01 7:55	22.09	46.3
4/9/01 7:57	22.09	46.3
4/9/01 7:59	22.09	46.3
4/9/01 8:01	22.09	46.3
4/9/01 8:03	22.09	46.3
4/9/01 8:05	22.09	46.3
4/9/01 8:07	22.09	46.3
4/9/01 8:09	22.09	46.3
4/9/01 8:11	22.09	46.3
4/9/01 8:13	22.09	46.3
4/9/01 8:15	22.09	46.3
4/9/01 8:17	22.09	46.3
4/9/01 8:19	22.09	46.3
4/9/01 8:21	22.09	46.3
4/9/01 8:23	22.09	46.3
4/9/01 8:25	22.09	46.3
4/9/01 8:27	22.09	46.3
4/9/01 8:29	22.09	46.3
4/9/01 8:31	22.09	46.8
4/9/01 8:33	22.09	46.8
4/9/01 8:35	22.09	46.3
4/9/01 8:37	22.09	46.3
4/9/01 8:39	22.09	46.8
4/9/01 8:41	22.09	46.8
4/9/01 8:43	22.09	46.8
4/9/01 8:45	22.09	47.4
4/9/01 8:47	22.09	47.4
4/9/01 8:49	22.09	47.9
4/9/01 8:51	22.09	47.9
4/9/01 8:53	22.09	47.9
4/9/01 8:55	22.09	48.4
4/9/01 8:57	22.09	48.4
4/9/01 8:59	22.09	48.4
4/9/01 9:01	22.48	48.4
4/9/01 9:03	22.48	48.9
4/9/01 9:05	22.48	48.4
4/9/01 9:07	22.48	48.9
4/9/01 9:09	22.48	48.9
4/9/01 9:11	22.48	48.9
4/9/01 9:13	22.48	48.9

Date And Time	Temperature (° C)	RH (%)
4/9/01 9:15	22.48	48.9
4/9/01 9:17	22.48	48.9
4/9/01 9:19	22.48	48.9
4/9/01 9:21	22.48	48.9
4/9/01 9:23	22.48	48.9
4/9/01 9:25	22.48	48.9
4/9/01 9:27	22.48	49.4
4/9/01 9:29	22.48	49.4
4/9/01 9:31	22.48	49.4
4/9/01 9:33	22.48	49.4
4/9/01 9:35	22.48	49.4
4/9/01 9:37	22.48	49.4
4/9/01 9:39	22.48	49.4
4/9/01 9:41	22.48	49.4
4/9/01 9:43	22.48	49.4
4/9/01 9:45	22.48	49.4
4/9/01 9:47	22.48	49.9
4/9/01 9:49	22.48	49.9
4/9/01 9:51	22.48	49.9
4/9/01 9:53	22.48	49.9
4/9/01 9:55	22.48	49.4
4/9/01 9:57	22.48	49.4
4/9/01 9:59	22.48	49.9
4/9/01 10:01	22.48	49.9
4/9/01 10:03	22.48	49.9
4/9/01 10:05	22.48	49.9
4/9/01 10:07	22.48	49.9
4/9/01 10:09	22.48	49.9
4/9/01 10:11	22.48	49.9
4/9/01 10:13	22.86	49.9
4/9/01 10:15	22.86	49.9
4/9/01 10:17	22.86	49.9
4/9/01 10:19	22.86	49.9
4/9/01 10:21	22.86	49.9
4/9/01 10:23	22.86	49.9
4/9/01 10:25	22.86	49.9
4/9/01 10:27	22.86	49.9
4/9/01 10:29	22.86	49.9
4/9/01 10:31	22.86	49.9
4/9/01 10:33	22.86	49.9
4/9/01 10:35	22.86	49.9
4/9/01 10:37	22.86	49.4
4/9/01 10:39	22.86	49.4
4/9/01 10:41	22.86	49.4
4/9/01 10:43	22.86	49.4
4/9/01 10:45	22.86	49.4
4/9/01 10:47	22.86	49.4
4/9/01 10:49	22.86	49.4
4/9/01 10:51	22.86	49.4
4/9/01 10:53	22.86	49.4

Date And Time	Temperature (° C)	RH (%)
4/9/01 10:55	22.86	50.5
4/9/01 10:57	23.24	48.9
4/9/01 10:59	23.63	48.4
4/9/01 11:01	24.01	56.2
4/9/01 11:03	24.01	61.3
4/9/01 11:05	23.63	64.9
4/9/01 11:07	23.24	67
4/9/01 11:09	22.86	69
4/9/01 11:11	22.86	70
4/9/01 11:13	22.48	75.4
4/9/01 11:15	22.48	77.4
4/9/01 11:17	22.48	79.7
4/9/01 11:19	22.09	80.7
4/9/01 11:21	22.09	81.6
4/9/01 11:23	21.71	82.1
4/9/01 11:25	21.71	83
4/9/01 11:27	21.71	83
4/9/01 11:29	21.71	83.9
4/9/01 11:31	21.71	84.8
4/9/01 11:33	21.33	84.3
4/9/01 11:35	21.33	85.7
4/9/01 11:37	21.33	85.7
4/9/01 11:39	21.71	85.2
4/9/01 11:41	21.33	84.3
4/9/01 11:43	21.33	85.7
4/9/01 11:45	21.71	86.6
4/9/01 11:47	21.71	87.4
4/9/01 11:49	21.71	85.2
4/9/01 11:51	21.71	86.1
4/9/01 11:53	21.71	85.7
4/9/01 11:55	21.71	85.2
4/9/01 11:57	21.71	87
4/9/01 11:59	21.71	86.1
4/9/01 12:01	21.71	85.7
4/9/01 12:03	21.71	86.1
4/9/01 12:05	22.09	85.7
4/9/01 12:07	22.09	86.1
4/9/01 12:09	22.09	87
4/9/01 12:11	22.09	86.6
4/9/01 12:13	22.09	85.7
4/9/01 12:15	22.09	84.8
4/9/01 12:17	22.48	84.3
4/9/01 12:19	22.48	84.8
4/9/01 12:21	22.48	85.2
4/9/01 12:23	22.48	85.2
4/9/01 12:25	22.48	84.8
4/9/01 12:27	22.48	84.8
4/9/01 12:29	22.48	84.8
4/9/01 12:31	22.86	84.3
4/9/01 12:33	22.86	84.3

Date And Time	Temperature (° C)	RH (%)
4/9/01 12:35	22.86	84.8
4/9/01 12:37	22.86	83
4/9/01 12:39	23.24	83.9
4/9/01 12:41	23.24	83.9
4/9/01 12:43	23.63	82.5
4/9/01 12:45	23.63	81.1
4/9/01 12:47	23.63	81.1
4/9/01 12:49	23.63	82.1
4/9/01 12:51	23.63	82.1
4/9/01 12:53	23.63	80.2
4/9/01 12:55	23.63	81.6
4/9/01 12:57	23.63	80.7
4/9/01 12:59	24.01	82.5
4/9/01 13:01	24.01	83
4/9/01 13:03	24.01	82.1
4/9/01 13:05	24.01	81.6
4/9/01 13:07	24.01	80.7
4/9/01 13:09	24.01	78.8
4/9/01 13:11	23.63	78.3
4/9/01 13:13	23.63	78.3
4/9/01 13:15	23.63	78.8
4/9/01 13:17	24.01	80.7
4/9/01 13:19	24.01	80.7
4/9/01 13:21	24.01	79.7
4/9/01 13:23	24.01	79.7
4/9/01 13:25	24.01	80.2
4/9/01 13:27	24.01	80.7
4/9/01 13:29	24.01	80.2
4/9/01 13:31	24.01	78.8
4/9/01 13:33	24.01	79.7
4/9/01 13:35	24.01	78.8
4/9/01 13:37	24.01	80.7
4/9/01 13:39	24.4	78.8
4/9/01 13:41	24.4	76.9
4/9/01 13:43	24.4	77.4
4/9/01 13:45	24.4	77.8
4/9/01 13:47	24.4	76.9
4/9/01 13:49	24.4	76.9
4/9/01 13:51	24.4	78.3
4/9/01 13:53	24.4	77.4
4/9/01 13:55	24.4	77.4
4/9/01 13:57	24.4	77.4
4/9/01 13:59	24.4	77.4
4/9/01 14:01	24.4	77.8
4/9/01 14:03	24.4	77.4
4/9/01 14:05	24.4	76.4
4/9/01 14:07	24.79	75.9
4/9/01 14:09	24.79	75.9
4/9/01 14:11	24.79	76.4
4/9/01 14:13	24.79	76.4

Date And Time	Temperature (° C)	RH (%)
4/9/01 14:15	24.79	75.4
4/9/01 14:17	24.4	75.4
4/9/01 14:19	24.79	76.4
4/9/01 14:21	24.79	76.4
4/9/01 14:23	24.79	75.4
4/9/01 14:25	24.4	75.9
4/9/01 14:27	24.4	75.4
4/9/01 14:29	24.4	75.9
4/9/01 14:31	24.79	81.1
4/9/01 14:33	24.79	76.4
4/9/01 14:35	24.79	74.9
4/9/01 14:37	24.79	74.4
4/9/01 14:39	24.79	77.4
4/9/01 14:41	25.17	74
4/9/01 14:43	24.79	73
4/9/01 14:45	24.79	72.5
4/9/01 14:47	24.79	74.4
4/9/01 14:49	24.79	74.4
4/9/01 14:51	24.79	77.8
4/9/01 14:53	24.79	74
4/9/01 14:55	24.79	75.9
4/9/01 14:57	24.79	72.5
4/9/01 14:59	24.79	73.5
4/9/01 15:01	24.79	73
4/9/01 15:03	24.79	72.5
4/9/01 15:05	24.79	73.5
4/9/01 15:07	24.79	75.4
4/9/01 15:09	25.17	73.5
4/9/01 15:11	25.17	71
4/9/01 15:13	25.17	70.5
4/9/01 15:15	25.17	71
4/9/01 15:17	24.79	71
4/9/01 15:19	24.79	71.5
4/9/01 15:21	24.79	72
4/9/01 15:23	24.79	71
4/9/01 15:25	25.17	70.5
4/9/01 15:27	25.17	74
4/9/01 15:29	25.17	75.4
4/9/01 15:31	25.17	74
4/9/01 15:33	25.17	70.5
4/9/01 15:35	25.17	72
4/9/01 15:37	25.17	71
4/9/01 15:39	25.17	75.4
4/9/01 15:41	25.17	78.3
4/9/01 15:43	25.17	73
4/9/01 15:45	25.17	73.5
4/9/01 15:47	24.79	77.8
4/9/01 15:49	24.79	73
4/9/01 15:51	24.79	76.9
4/9/01 15:53	25.17	73

Date And Time	Temperature (° C)	RH (%)
4/9/01 15:55	25.17	71
4/9/01 15:57	25.56	74
4/9/01 15:59	25.56	74
4/9/01 16:01	25.56	73
4/9/01 16:03	25.17	72
4/9/01 16:05	25.17	73.5
4/9/01 16:07	25.17	72
4/9/01 16:09	25.17	74
4/9/01 16:11	25.17	74
4/9/01 16:13	25.17	77.4
4/9/01 16:15	25.17	76.4
4/9/01 16:17	25.17	73
4/9/01 16:19	25.17	72
4/9/01 16:21	25.17	72.5
4/9/01 16:23	25.17	74
4/9/01 16:25	25.17	72.5
4/9/01 16:27	25.17	71
4/9/01 16:29	25.56	74.9
4/9/01 16:31	25.56	74.9
4/9/01 16:33	25.56	73
4/9/01 16:35	25.56	77.8
4/9/01 16:37	25.17	74.4
4/9/01 16:39	25.17	74.4
4/9/01 16:41	25.17	74.9
4/9/01 16:43	25.17	75.4
4/9/01 16:45	25.17	72.5
4/9/01 16:47	24.79	71
4/9/01 16:49	24.79	72
4/9/01 16:51	24.79	74
4/9/01 16:53	24.79	73.5
4/9/01 16:55	25.17	77.8
4/9/01 16:57	25.17	76.4
4/9/01 16:59	25.17	77.8
4/9/01 17:01	25.17	75.9
4/9/01 17:03	25.17	72
4/9/01 17:05	25.17	74
4/9/01 17:07	25.17	75.9
4/9/01 17:09	25.17	74.9
4/9/01 17:11	25.17	81.6
4/9/01 17:13	25.17	74.4
4/9/01 17:15	25.17	76.4
4/9/01 17:17	25.17	73.5
4/9/01 17:19	25.17	74
4/9/01 17:21	25.17	73.5
4/9/01 17:23	25.17	74
4/9/01 17:25	25.17	74
4/9/01 17:27	25.17	72.5
4/9/01 17:29	25.17	72.5
4/9/01 17:31	25.17	72.5
4/9/01 17:33	25.17	72

Date And Time	Temperature (° C)	RH (%)
4/9/01 17:35	25.17	72
4/9/01 17:37	25.17	74.4
4/9/01 17:39	25.17	72.5
4/9/01 17:41	25.17	75.9
4/9/01 17:43	24.79	72
4/9/01 17:45	24.79	76.9
4/9/01 17:47	24.79	82.1
4/9/01 17:49	24.79	74.9
4/9/01 17:51	24.79	74.9
4/9/01 17:53	24.79	74.4
4/9/01 17:55	24.79	73.5
4/9/01 17:57	24.79	73.5
4/9/01 17:59	24.79	73.5
4/9/01 18:01	24.79	74.9
4/9/01 18:03	24.79	75.9
4/9/01 18:05	24.4	78.8
4/9/01 18:07	24.4	83.9
4/9/01 18:09	24.4	83.4
4/9/01 18:11	24.4	79.3
4/9/01 18:13	24.4	78.8
4/9/01 18:15	24.4	78.8
4/9/01 18:17	24.4	78.8
4/9/01 18:19	24.4	82.1
4/9/01 18:21	24.4	81.6
4/9/01 18:23	24.01	82.1
4/9/01 18:25	24.01	78.8
4/9/01 18:27	24.01	79.3
4/9/01 18:29	24.01	78.3
4/9/01 18:31	24.01	77.8
4/9/01 18:33	24.01	78.8
4/9/01 18:35	24.01	79.3
4/9/01 18:37	24.01	81.1
4/9/01 18:39	23.63	83.4
4/9/01 18:41	23.63	83.4
4/9/01 18:43	23.63	83
4/9/01 18:45	23.63	82.1
4/9/01 18:47	23.63	81.6
4/9/01 18:49	23.63	83
4/9/01 18:51	23.63	83.4
4/9/01 18:53	23.24	84.3
4/9/01 18:55	23.24	82.1
4/9/01 18:57	23.24	82.5
4/9/01 18:59	23.24	83.4
4/9/01 19:01	23.24	83.4
4/9/01 19:03	23.24	82.1
4/9/01 19:05	23.24	81.6
4/9/01 19:07	22.86	82.1
4/9/01 19:09	22.86	81.6
4/9/01 19:11	22.86	82.1
4/9/01 19:13	22.86	83.9

Date And Time	Temperature (° C)	RH (%)
4/9/01 19:15	22.86	83.4
4/9/01 19:17	22.86	83.4
4/9/01 19:19	22.86	83.9
4/9/01 19:21	22.86	83.4
4/9/01 19:23	22.86	83.4
4/9/01 19:25	22.48	82.5
4/9/01 19:27	22.48	83
4/9/01 19:29	22.48	84.8
4/9/01 19:31	22.48	84.3
4/9/01 19:33	22.48	83.9
4/9/01 19:35	22.48	83.4
4/9/01 19:37	22.09	83.9
4/9/01 19:39	22.09	84.3
4/9/01 19:41	22.09	84.3
4/9/01 19:43	22.09	84.3
4/9/01 19:45	22.09	84.8
4/9/01 19:47	22.09	85.2
4/9/01 19:49	22.09	85.2
4/9/01 19:51	22.09	85.2
4/9/01 19:53	21.71	85.7
4/9/01 19:55	21.71	85.7
4/9/01 19:57	21.71	85.7
4/9/01 19:59	21.71	85.7
4/9/01 20:01	21.71	86.1
4/9/01 20:03	21.71	86.1
4/9/01 20:05	21.71	86.1
4/9/01 20:07	21.33	86.1
4/9/01 20:09	21.33	86.6
4/9/01 20:11	21.33	87
4/9/01 20:13	21.33	87.9
4/9/01 20:15	21.33	87.4
4/9/01 20:17	21.33	88.3
4/9/01 20:19	21.33	88.7
4/9/01 20:21	21.33	89.6
4/9/01 20:23	21.33	87.9
4/9/01 20:25	21.33	87.4
4/9/01 20:27	21.33	87.4
4/9/01 20:29	21.33	87.4
4/9/01 20:31	20.95	87.9
4/9/01 20:33	20.95	87.9
4/9/01 20:35	20.95	87.9
4/9/01 20:37	20.95	88.3
4/9/01 20:39	20.95	88.3
4/9/01 20:41	20.95	88.3
4/9/01 20:43	20.95	88.3
4/9/01 20:45	20.95	88.3
4/9/01 20:47	20.95	88.3
4/9/01 20:49	20.57	88.7
4/9/01 20:51	20.57	88.7
4/9/01 20:53	20.57	89.6

Date And Time	Temperature (° C)	RH (%)
4/9/01 20:55	20.57	89.6
4/9/01 20:57	20.57	89.6
4/9/01 20:59	20.57	89.6
4/9/01 21:01	20.57	88.7
4/9/01 21:03	20.57	89.6
4/9/01 21:05	20.57	89.6
4/9/01 21:07	20.57	89.6
4/9/01 21:09	20.57	89.1
4/9/01 21:11	20.57	88.3
4/9/01 21:13	20.57	88.3
4/9/01 21:15	20.57	88.7
4/9/01 21:17	20.57	89.6
4/9/01 21:19	20.57	89.6
4/9/01 21:21	20.57	89.6
4/9/01 21:23	20.57	90
4/9/01 21:25	20.57	90
4/9/01 21:27	20.57	90.4
4/9/01 21:29	20.19	90.8
4/9/01 21:31	20.19	90.4
4/9/01 21:33	20.19	90.4
4/9/01 21:35	20.19	90
4/9/01 21:37	20.19	90
4/9/01 21:39	20.19	89.6
4/9/01 21:41	20.19	89.6
4/9/01 21:43	20.19	90
4/9/01 21:45	20.19	90
4/9/01 21:47	20.19	90
4/9/01 21:49	20.19	90.4
4/9/01 21:51	20.19	90.4
4/9/01 21:53	20.19	90.4
4/9/01 21:55	20.19	90.4
4/9/01 21:57	19.81	90.4
4/9/01 21:59	19.81	90.4
4/9/01 22:01	19.81	90.4
4/9/01 22:03	19.81	90.8
4/9/01 22:05	19.81	90.8
4/9/01 22:07	19.81	90.8
4/9/01 22:09	19.81	91.2
4/9/01 22:11	19.81	91.6
4/9/01 22:13	19.81	91.2
4/9/01 22:15	19.81	91.2
4/9/01 22:17	19.81	91.2
4/9/01 22:19	19.81	91.6
4/9/01 22:21	19.81	91.6
4/9/01 22:23	19.81	92
4/9/01 22:25	19.81	91.6
4/9/01 22:27	19.42	91.2
4/9/01 22:29	19.42	91.2
4/9/01 22:31	19.42	91.2
4/9/01 22:33	19.42	91.2

Date And Time	Temperature (° C)	RH (%)
4/9/01 22:35	19.42	91.6
4/9/01 22:37	19.42	91.6
4/9/01 22:39	19.04	92
4/9/01 22:41	19.04	92
4/9/01 22:43	19.04	92
4/9/01 22:45	19.04	92
4/9/01 22:47	19.04	92
4/9/01 22:49	19.04	92
4/9/01 22:51	19.04	92.4
4/9/01 22:53	19.04	92.4
4/9/01 22:55	19.04	92.4
4/9/01 22:57	19.04	92.4
4/9/01 22:59	19.04	92.4
4/9/01 23:01	19.04	92.4
4/9/01 23:03	19.04	92.4
4/9/01 23:05	19.04	92.4
4/9/01 23:07	19.04	93.2
4/9/01 23:09	19.04	92.8
4/9/01 23:11	19.04	93.6
4/9/01 23:13	19.04	93.2
4/9/01 23:15	19.04	92.4
4/9/01 23:17	19.04	92
4/9/01 23:19	19.04	92.8
4/9/01 23:21	19.04	92.8
4/9/01 23:23	19.04	92.8
4/9/01 23:25	19.04	92.4
4/9/01 23:27	19.04	92
4/9/01 23:29	19.04	92
4/9/01 23:31	19.04	92.4
4/9/01 23:33	18.66	92.4
4/9/01 23:35	18.66	92.4
4/9/01 23:37	18.66	92.8
4/9/01 23:39	18.66	92.4
4/9/01 23:41	18.66	92.8
4/9/01 23:43	18.66	92.4
4/9/01 23:45	18.66	92.8
4/9/01 23:47	18.66	92.8
4/9/01 23:49	18.66	92.8
4/9/01 23:51	18.66	92.4
4/9/01 23:53	18.66	92
4/9/01 23:55	18.66	92.4
4/9/01 23:57	18.66	92.8
4/9/01 23:59	18.66	92.8
4/10/01 0:01	18.66	92.8
4/10/01 0:03	18.66	93.2
4/10/01 0:05	18.66	93.2
4/10/01 0:07	18.66	92.8
4/10/01 0:09	18.66	92.8
4/10/01 0:11	18.66	92.4
4/10/01 0:13	18.66	92.4

Date And Time	Temperature (° C)	RH (%)
4/10/01 0:15	18.66	92.8
4/10/01 0:17	18.66	92.8
4/10/01 0:19	18.66	93.2
4/10/01 0:21	18.66	93.2
4/10/01 0:23	18.66	93.2
4/10/01 0:25	18.66	93.2
4/10/01 0:27	18.66	93.2
4/10/01 0:29	18.66	93.2
4/10/01 0:31	18.66	93.6
4/10/01 0:33	18.66	93.6
4/10/01 0:35	18.66	93.6
4/10/01 0:37	18.66	93.6
4/10/01 0:39	18.66	93.6
4/10/01 0:41	18.66	93.6
4/10/01 0:43	18.66	93.6
4/10/01 0:45	18.66	93.6
4/10/01 0:47	18.66	94
4/10/01 0:49	18.66	94
4/10/01 0:51	18.66	94
4/10/01 0:53	18.66	94.4
4/10/01 0:55	18.66	94.4
4/10/01 0:57	18.66	94.8
4/10/01 0:59	18.66	94.8
4/10/01 1:01	18.66	94.8
4/10/01 1:03	18.66	94.8
4/10/01 1:05	18.66	94.8
4/10/01 1:07	18.66	94.8
4/10/01 1:09	18.66	94.8
4/10/01 1:11	18.66	95.2
4/10/01 1:13	18.66	95.5
4/10/01 1:15	18.66	95.2
4/10/01 1:17	18.66	95.2
4/10/01 1:19	18.66	95.2
4/10/01 1:21	18.66	95.2
4/10/01 1:23	18.66	95.2
4/10/01 1:25	18.66	95.2
4/10/01 1:27	18.66	95.2
4/10/01 1:29	18.66	95.5
4/10/01 1:31	18.66	95.2
4/10/01 1:33	18.66	95.5
4/10/01 1:35	18.66	95.5
4/10/01 1:37	18.66	95.5
4/10/01 1:39	18.66	95.5
4/10/01 1:41	18.66	95.5
4/10/01 1:43	18.66	95.5
4/10/01 1:45	18.66	95.5
4/10/01 1:47	18.66	95.9
4/10/01 1:49	18.66	95.5
4/10/01 1:51	18.66	95.5
4/10/01 1:53	18.66	95.9

Date And Time	Temperature (° C)	RH (%)
4/10/01 1:55	18.66	95.9
4/10/01 1:57	18.66	95.9
4/10/01 1:59	18.66	95.9
4/10/01 2:01	18.66	95.9
4/10/01 2:03	18.66	95.9
4/10/01 2:05	18.66	95.9
4/10/01 2:07	18.66	95.9
4/10/01 2:09	18.66	95.9
4/10/01 2:11	18.66	95.9
4/10/01 2:13	18.66	95.9
4/10/01 2:15	18.66	95.9
4/10/01 2:17	18.28	95.9
4/10/01 2:19	18.28	95.9
4/10/01 2:21	18.28	95.9
4/10/01 2:23	18.28	95.9
4/10/01 2:25	18.28	95.9
4/10/01 2:27	18.28	95.9
4/10/01 2:29	18.28	96.3
4/10/01 2:31	18.28	96.3
4/10/01 2:33	18.28	96.3
4/10/01 2:35	18.28	96.3
4/10/01 2:37	18.28	96.3
4/10/01 2:39	18.28	96.7
4/10/01 2:41	18.28	96.3
4/10/01 2:43	18.28	96.3
4/10/01 2:45	18.28	96.3
4/10/01 2:47	18.28	96.3
4/10/01 2:49	18.28	96.7
4/10/01 2:51	18.28	96.3
4/10/01 2:53	18.28	96.3
4/10/01 2:55	18.28	96.7
4/10/01 2:57	18.28	96.7
4/10/01 2:59	18.28	96.7
4/10/01 3:01	18.28	97
4/10/01 3:03	18.28	97
4/10/01 3:05	18.28	97
4/10/01 3:07	18.28	97
4/10/01 3:09	18.28	96.7
4/10/01 3:11	18.28	97
4/10/01 3:13	18.28	97
4/10/01 3:15	18.28	97
4/10/01 3:17	18.28	97
4/10/01 3:19	18.28	97
4/10/01 3:21	18.28	97
4/10/01 3:23	18.28	97
4/10/01 3:25	18.28	97
4/10/01 3:27	18.28	97
4/10/01 3:29	18.28	97
4/10/01 3:31	18.28	97
4/10/01 3:33	18.28	97

Date And Time	Temperature (° C)	RH (%)
4/10/01 3:35	18.28	97
4/10/01 3:37	18.28	97
4/10/01 3:39	17.9	97
4/10/01 3:41	17.9	96.7
4/10/01 3:43	17.9	96.7
4/10/01 3:45	17.9	96.7
4/10/01 3:47	17.9	97
4/10/01 3:49	17.9	97
4/10/01 3:51	17.9	97
4/10/01 3:53	17.9	97.4
4/10/01 3:55	17.9	97
4/10/01 3:57	17.9	97
4/10/01 3:59	17.9	97
4/10/01 4:01	17.9	96.7
4/10/01 4:03	17.9	96.7
4/10/01 4:05	17.9	96.7
4/10/01 4:07	17.9	97
4/10/01 4:09	17.9	97
4/10/01 4:11	17.9	97.4
4/10/01 4:13	17.9	97.4
4/10/01 4:15	17.9	97.4
4/10/01 4:17	17.9	97.4
4/10/01 4:19	18.28	97.4
4/10/01 4:21	18.28	97.4
4/10/01 4:23	18.28	97.4
4/10/01 4:25	18.28	97
4/10/01 4:27	18.28	97.4
4/10/01 4:29	18.28	97.4
4/10/01 4:31	18.28	97.4
4/10/01 4:33	18.28	97.4
4/10/01 4:35	18.28	97
4/10/01 4:37	18.28	97
4/10/01 4:39	17.9	96.7
4/10/01 4:41	17.9	96.7
4/10/01 4:43	17.9	96.7
4/10/01 4:45	17.9	97
4/10/01 4:47	17.9	97
4/10/01 4:49	17.9	97
4/10/01 4:51	17.9	97
4/10/01 4:53	17.9	97
4/10/01 4:55	17.9	97.4
4/10/01 4:57	17.9	97.4
4/10/01 4:59	17.9	97.4
4/10/01 5:01	17.9	97
4/10/01 5:03	17.9	97
4/10/01 5:05	17.9	97
4/10/01 5:07	17.9	97
4/10/01 5:09	17.9	97
4/10/01 5:11	17.9	97
4/10/01 5:13	17.9	97

Date And Time	Temperature (° C)	RH (%)
4/10/01 5:15	17.9	96.7
4/10/01 5:17	17.9	96.3
4/10/01 5:19	17.9	96.3
4/10/01 5:21	17.9	96.3
4/10/01 5:23	17.9	97
4/10/01 5:25	17.9	96.7
4/10/01 5:27	17.9	96.3
4/10/01 5:29	17.52	96.3
4/10/01 5:31	17.52	95.9
4/10/01 5:33	17.52	95.9
4/10/01 5:35	17.52	96.3
4/10/01 5:37	17.52	96.3
4/10/01 5:39	17.52	96.7
4/10/01 5:41	17.52	97
4/10/01 5:43	17.52	97
4/10/01 5:45	17.9	97
4/10/01 5:47	17.9	97
4/10/01 5:49	17.9	97
4/10/01 5:51	17.52	97
4/10/01 5:53	17.52	97
4/10/01 5:55	17.52	97
4/10/01 5:57	17.52	96.7
4/10/01 5:59	17.52	96.3
4/10/01 6:01	17.52	96.3
4/10/01 6:03	17.52	95.9
4/10/01 6:05	17.52	96.3
4/10/01 6:07	17.52	96.3
4/10/01 6:09	17.14	96.3
4/10/01 6:11	17.14	96.3
4/10/01 6:13	17.14	95.9
4/10/01 6:15	17.14	96.3
4/10/01 6:17	17.14	96.3
4/10/01 6:19	17.14	96.7
4/10/01 6:21	17.14	97
4/10/01 6:23	17.14	96.7
4/10/01 6:25	17.14	96.3
4/10/01 6:27	17.14	96.3
4/10/01 6:29	17.14	96.3
4/10/01 6:31	17.14	95.5
4/10/01 6:33	17.14	95.5
4/10/01 6:35	17.14	95.5
4/10/01 6:37	17.14	95.5
4/10/01 6:39	17.14	95.5
4/10/01 6:41	17.14	95.5
4/10/01 6:43	17.14	95.9
4/10/01 6:45	17.14	96.7
4/10/01 6:47	17.14	97.4
4/10/01 6:49	17.14	97
4/10/01 6:51	17.14	97
4/10/01 6:53	17.14	97

Date And Time	Temperature (° C)	RH (%)
4/10/01 6:55	17.14	97
4/10/01 6:57	17.14	97.4
4/10/01 6:59	17.14	97.4
4/10/01 7:01	17.14	97.4
4/10/01 7:03	17.14	97.4
4/10/01 7:05	17.14	97.4
4/10/01 7:07	17.14	97.4
4/10/01 7:09	17.52	97.4
4/10/01 7:11	17.52	97.4
4/10/01 7:13	17.52	97.7
4/10/01 7:15	17.52	97.7
4/10/01 7:17	17.52	97.7
4/10/01 7:19	17.52	97.4
4/10/01 7:21	17.52	97.4
4/10/01 7:23	17.52	97.4
4/10/01 7:25	17.52	97.4
4/10/01 7:27	17.52	97.4
4/10/01 7:29	17.52	97.4
4/10/01 7:31	17.52	97.4
4/10/01 7:33	17.9	97
4/10/01 7:35	17.9	97
4/10/01 7:37	17.9	97.4
4/10/01 7:39	17.9	97.4
4/10/01 7:41	17.9	97.4
4/10/01 7:43	17.9	97.4
4/10/01 7:45	17.9	97.7
4/10/01 7:47	18.28	97.7
4/10/01 7:49	18.28	98.1
4/10/01 7:51	18.28	98.1
4/10/01 7:53	18.28	97.7
4/10/01 7:55	18.28	97.7
4/10/01 7:57	18.28	98.1
4/10/01 7:59	18.66	98.1
4/10/01 8:01	18.66	98.1
4/10/01 8:03	18.66	98.1
4/10/01 8:05	18.66	98.4
4/10/01 8:07	18.66	98.1
4/10/01 8:09	19.04	98.1
4/10/01 8:11	19.04	98.1
4/10/01 8:13	19.04	98.1
4/10/01 8:15	19.04	98.1
4/10/01 8:17	19.04	98.1
4/10/01 8:19	19.04	98.4
4/10/01 8:21	19.42	98.4
4/10/01 8:23	19.42	98.1
4/10/01 8:25	19.42	98.1
4/10/01 8:27	19.42	98.1
4/10/01 8:29	19.42	98.1
4/10/01 8:31	19.81	98.1
4/10/01 8:33	19.81	98.1

Date And Time	Temperature (° C)	RH (%)
4/10/01 8:35	19.81	97.7
4/10/01 8:37	19.81	97.7
4/10/01 8:39	19.81	97.7
4/10/01 8:41	20.19	97.7
4/10/01 8:43	20.19	97.7
4/10/01 8:45	20.19	97.7
4/10/01 8:47	20.57	97
4/10/01 8:49	20.57	97
4/10/01 8:51	20.57	97
4/10/01 8:53	20.95	97
4/10/01 8:55	20.95	96.7
4/10/01 8:57	20.95	96.3
4/10/01 8:59	20.95	95.9
4/10/01 9:01	20.95	95.5
4/10/01 9:03	20.95	95.9
4/10/01 9:05	20.95	95.9
4/10/01 9:07	20.95	95.9
4/10/01 9:09	20.95	95.5
4/10/01 9:11	20.95	95.5
4/10/01 9:13	21.33	95.2
4/10/01 9:15	21.33	94.8
4/10/01 9:17	21.71	94.4
4/10/01 9:19	22.48	92.4
4/10/01 9:21	23.63	89.6
4/10/01 9:23	24.4	87.9
4/10/01 9:25	25.17	86.6
4/10/01 9:27	25.95	85.2
4/10/01 9:29	26.34	84.3
4/10/01 9:31	27.12	83.4
4/10/01 9:33	27.52	83
4/10/01 9:35	27.52	82.5
4/10/01 9:37	28.31	83.4
4/10/01 9:39	28.31	81.1
4/10/01 9:41	28.7	80.2
4/10/01 9:43	29.1	80.2
4/10/01 9:45	29.1	80.2
4/10/01 9:47	29.5	80.7
4/10/01 9:49	29.9	80.2
4/10/01 9:51	30.31	80.2
4/10/01 9:53	30.31	77.8
4/10/01 9:55	30.71	79.3
4/10/01 9:57	30.31	76.4
4/10/01 9:59	30.71	77.4
4/10/01 10:01	30.71	74.9
4/10/01 10:03	31.12	76.9
4/10/01 10:05	31.12	76.4
4/10/01 10:07	31.52	75.4
4/10/01 10:09	31.52	75.9
4/10/01 10:11	31.93	76.4
4/10/01 10:13	32.34	74.9

Date And Time	Temperature (° C)	RH (%)
4/10/01 10:15	32.34	76.9
4/10/01 10:17	32.76	75.9
4/10/01 10:19	32.76	74.9
4/10/01 10:21	32.76	73
4/10/01 10:23	32.34	71.5
4/10/01 10:25	32.76	73.5
4/10/01 10:27	33.17	74.9
4/10/01 10:29	33.17	74
4/10/01 10:31	33.17	72.5
4/10/01 10:33	32.76	70.5
4/10/01 10:35	32.76	71.5
4/10/01 10:37	32.34	70
4/10/01 10:39	32.76	72.5
4/10/01 10:41	32.76	69.5
4/10/01 10:43	32.76	70.5
4/10/01 10:45	33.17	71.5
4/10/01 10:47	33.17	68
4/10/01 10:49	33.17	68.5
4/10/01 10:51	33.17	68.5
4/10/01 10:53	33.17	67
4/10/01 10:55	33.17	65.9
4/10/01 10:57	33.59	68.5
4/10/01 10:59	34.43	70.5
4/10/01 11:01	34.85	70.5
4/10/01 11:03	34.43	67
4/10/01 11:05	34.43	67.5
4/10/01 11:07	34.43	67.5
4/10/01 11:09	34.43	65.9
4/10/01 11:11	34.01	65.4
4/10/01 11:13	34.43	65.9
4/10/01 11:15	34.43	67
4/10/01 11:17	34.85	71
4/10/01 11:19	35.27	72
4/10/01 11:21	35.27	68
4/10/01 11:23	35.27	69.5
4/10/01 11:25	35.27	71.5
4/10/01 11:27	35.27	71
4/10/01 11:29	34.85	68
4/10/01 11:31	34.43	66.4
4/10/01 11:33	34.43	62.9
4/10/01 11:35	34.43	67.5
4/10/01 11:37	34.01	72
4/10/01 11:39	34.01	73
4/10/01 11:41	34.01	74.4
4/10/01 11:43	34.01	71.5
4/10/01 11:45	34.01	72
4/10/01 11:47	34.01	74.9
4/10/01 11:49	33.59	70
4/10/01 11:51	34.01	71.5
4/10/01 11:53	33.59	62.9

Date And Time	Temperature (° C)	RH (%)
4/10/01 11:55	33.59	65.4
4/10/01 11:57	33.59	62.4
4/10/01 11:59	33.59	59.8
4/10/01 12:01	33.17	62.4
4/10/01 12:03	33.17	71
4/10/01 12:05	33.59	64.9
4/10/01 12:07	33.17	59.3
4/10/01 12:09	33.17	68
4/10/01 12:11	33.17	65.4
4/10/01 12:13	32.76	62.9
4/10/01 12:15	32.76	59.3
4/10/01 12:17	32.76	63.9
4/10/01 12:19	32.76	63.4
4/10/01 12:21	32.76	64.9
4/10/01 12:23	33.17	65.9
4/10/01 12:25	33.17	69
4/10/01 12:27	33.17	60.8
4/10/01 12:29	33.17	62.9
4/10/01 12:31	33.17	54.6
4/10/01 12:33	33.17	60.3
4/10/01 12:35	33.17	68
4/10/01 12:37	33.17	65.4
4/10/01 12:39	33.17	65.4
4/10/01 12:41	33.59	58.2
4/10/01 12:43	33.17	56.2
4/10/01 12:45	33.17	59.3
4/10/01 12:47	33.17	70
4/10/01 12:49	33.17	69.5
4/10/01 12:51	32.76	51
4/10/01 12:53	32.34	59.3
4/10/01 12:55	32.34	58.2
4/10/01 12:57	31.93	51
4/10/01 12:59	31.93	50.5
4/10/01 13:01	31.93	69
4/10/01 13:03	31.93	55.6
4/10/01 13:05	31.93	68.5
4/10/01 13:07	31.93	73
4/10/01 13:09	31.93	60.3
4/10/01 13:11	31.93	61.8
4/10/01 13:13	31.93	68
4/10/01 13:15	31.93	61.8
4/10/01 13:17	31.93	61.3
4/10/01 13:19	31.93	70.5
4/10/01 13:21	31.93	69
4/10/01 13:23	31.93	63.4
4/10/01 13:25	31.93	63.9
4/10/01 13:27	31.93	74.4
4/10/01 13:29	31.93	61.8
4/10/01 13:31	31.93	59.8
4/10/01 13:33	31.93	60.8

Date And Time	Temperature (° C)	RH (%)
4/10/01 13:35	31.93	54.1
4/10/01 13:37	31.52	68.5
4/10/01 13:39	31.52	67.5
4/10/01 13:41	31.52	66.4
4/10/01 13:43	31.52	56.2
4/10/01 13:45	31.52	59.8
4/10/01 13:47	31.52	55.6
4/10/01 13:49	31.52	58.2
4/10/01 13:51	31.52	62.9
4/10/01 13:53	31.52	57.2
4/10/01 13:55	31.52	60.8
4/10/01 13:57	31.52	58.7
4/10/01 13:59	31.52	62.9
4/10/01 14:01	31.52	58.2
4/10/01 14:03	31.52	53.6
4/10/01 14:05	31.52	61.8
4/10/01 14:07	31.12	66.4
4/10/01 14:09	31.12	56.7
4/10/01 14:11	31.12	55.1
4/10/01 14:13	31.12	63.9
4/10/01 14:15	31.12	65.9
4/10/01 14:17	31.12	64.4
4/10/01 14:19	31.12	65.9
4/10/01 14:21	31.12	68.5
4/10/01 14:23	31.12	57.2
4/10/01 14:25	31.12	51
4/10/01 14:27	31.12	52.5
4/10/01 14:29	31.12	55.6
4/10/01 14:31	31.12	59.3
4/10/01 14:33	31.12	58.7
4/10/01 14:35	31.12	48.9
4/10/01 14:37	31.12	58.7
4/10/01 14:39	31.12	59.8
4/10/01 14:41	31.12	52
4/10/01 14:43	31.12	53
4/10/01 14:45	31.12	51.5
4/10/01 14:47	31.12	59.3
4/10/01 14:49	31.12	73.5
4/10/01 14:51	31.12	56.7
4/10/01 14:53	31.12	57.2
4/10/01 14:55	31.12	63.4
4/10/01 14:57	31.12	57.2
4/10/01 14:59	31.12	48.9
4/10/01 15:01	31.12	70.5
4/10/01 15:03	31.12	61.8
4/10/01 15:05	31.12	58.2
4/10/01 15:07	30.71	60.3
4/10/01 15:09	30.71	62.9
4/10/01 15:11	30.71	63.9
4/10/01 15:13	30.71	52.5

Date And Time	Temperature (º C)	RH (%)
4/10/01 15:15	30.71	49.9
4/10/01 15:17	30.71	49.9
4/10/01 15:19	30.71	50.5
4/10/01 15:21	30.71	57.2
4/10/01 15:23	31.12	60.3
4/10/01 15:25	31.12	56.2
4/10/01 15:27	30.71	51.5
4/10/01 15:29	31.12	56.7
4/10/01 15:31	31.12	55.1
4/10/01 15:33	31.12	60.8
4/10/01 15:35	31.12	57.7
4/10/01 15:37	30.71	57.7
4/10/01 15:39	30.71	57.2
4/10/01 15:41	30.71	64.9
4/10/01 15:43	30.71	58.2
4/10/01 15:45	30.71	63.9
4/10/01 15:47	30.71	62.9
4/10/01 15:49	30.71	59.8
4/10/01 15:51	30.71	64.4
4/10/01 15:53	30.71	58.2
4/10/01 15:55	30.71	60.8
4/10/01 15:57	30.31	66.4
4/10/01 15:59	30.31	63.4
4/10/01 16:01	30.31	59.3
4/10/01 16:03	30.31	61.3
4/10/01 16:05	30.31	59.8
4/10/01 16:07	30.31	58.7
4/10/01 16:09	30.31	57.7
4/10/01 16:11	30.31	63.4
4/10/01 16:13	30.31	58.7
4/10/01 16:15	30.31	59.8
4/10/01 16:17	30.31	59.3
4/10/01 16:19	30.31	60.8
4/10/01 16:21	30.31	56.7
4/10/01 16:23	30.31	56.7
4/10/01 16:25	30.31	66.4
4/10/01 16:27	30.31	58.7
4/10/01 16:29	30.31	55.6
4/10/01 16:31	30.31	56.7
4/10/01 16:33	30.31	61.3
4/10/01 16:35	30.31	56.7
4/10/01 16:37	30.31	58.2
4/10/01 16:39	30.31	58.7
4/10/01 16:41	30.31	57.7
4/10/01 16:43	30.31	59.8
4/10/01 16:45	30.31	59.8
4/10/01 16:47	30.31	60.3
4/10/01 16:49	30.31	65.9
4/10/01 16:51	29.9	55.6
4/10/01 16:53	29.9	58.2

Date And Time	Temperature (° C)	RH (%)
4/10/01 16:55	29.9	57.2
4/10/01 16:57	29.9	60.8
4/10/01 16:59	29.9	59.3
4/10/01 17:01	29.9	59.8
4/10/01 17:03	29.9	71
4/10/01 17:05	29.9	69.5
4/10/01 17:07	29.9	58.7
4/10/01 17:09	29.9	60.8
4/10/01 17:11	29.9	60.3
4/10/01 17:13	29.9	64.9
4/10/01 17:15	29.9	57.7
4/10/01 17:17	29.9	60.8
4/10/01 17:19	29.9	58.7
4/10/01 17:21	29.9	59.3
4/10/01 17:23	29.9	62.4
4/10/01 17:25	29.5	67
4/10/01 17:27	29.5	56.2
4/10/01 17:29	29.5	64.4
4/10/01 17:31	29.5	73
4/10/01 17:33	29.5	59.8
4/10/01 17:35	29.5	62.4
4/10/01 17:37	29.5	55.6
4/10/01 17:39	29.5	56.2
4/10/01 17:41	29.5	54.6
4/10/01 17:43	29.5	55.1
4/10/01 17:45	29.5	60.8
4/10/01 17:47	29.1	58.7
4/10/01 17:49	29.1	62.9
4/10/01 17:51	29.1	69
4/10/01 17:53	29.1	67
4/10/01 17:55	29.1	65.4
4/10/01 17:57	29.1	62.4
4/10/01 17:59	29.1	69.5
4/10/01 18:01	29.1	73.5
4/10/01 18:03	29.1	70
4/10/01 18:05	28.7	70
4/10/01 18:07	28.7	69.5
4/10/01 18:09	28.7	68.5
4/10/01 18:11	28.7	70.5
4/10/01 18:13	28.7	66.4
4/10/01 18:15	28.31	71.5
4/10/01 18:17	28.31	65.4
4/10/01 18:19	28.31	68.5
4/10/01 18:21	28.31	67.5
4/10/01 18:23	28.31	69.5
4/10/01 18:25	28.31	70
4/10/01 18:27	28.31	74.4
4/10/01 18:29	27.91	70
4/10/01 18:31	27.91	72.5
4/10/01 18:33	27.91	76.9

Date And Time	Temperature (° C)	RH (%)
4/10/01 18:35	27.91	70.5
4/10/01 18:37	27.91	70
4/10/01 18:39	27.91	68.5
4/10/01 18:41	27.91	70.5
4/10/01 18:43	27.52	76.4
4/10/01 18:45	27.52	76.4
4/10/01 18:47	27.52	72
4/10/01 18:49	27.52	70.5
4/10/01 18:51	27.52	74
4/10/01 18:53	27.52	74
4/10/01 18:55	27.52	71
4/10/01 18:57	27.52	71.5
4/10/01 18:59	27.12	69
4/10/01 19:01	27.12	70.5
4/10/01 19:03	27.12	72
4/10/01 19:05	27.12	72
4/10/01 19:07	27.12	69
4/10/01 19:09	27.12	72.5
4/10/01 19:11	27.12	71.5
4/10/01 19:13	26.73	70.5
4/10/01 19:15	26.73	72
4/10/01 19:17	26.73	72.5
4/10/01 19:19	26.73	73.5
4/10/01 19:21	26.73	72
4/10/01 19:23	26.73	71.5
4/10/01 19:25	26.73	73.5
4/10/01 19:27	26.73	72.5
4/10/01 19:29	26.34	72
4/10/01 19:31	26.34	71
4/10/01 19:33	26.34	71
4/10/01 19:35	26.34	71.5
4/10/01 19:37	26.34	72
4/10/01 19:39	26.34	72.5
4/10/01 19:41	26.34	73
4/10/01 19:43	26.34	73.5
4/10/01 19:45	25.95	73
4/10/01 19:47	25.95	73
4/10/01 19:49	25.95	73
4/10/01 19:51	25.95	74
4/10/01 19:53	25.95	73
4/10/01 19:55	25.95	73.5
4/10/01 19:57	25.56	73.5
4/10/01 19:59	25.56	73.5
4/10/01 20:01	25.56	74
4/10/01 20:03	25.56	74.4
4/10/01 20:05	25.56	74.4
4/10/01 20:07	25.56	74.9
4/10/01 20:09	25.56	74.4
4/10/01 20:11	25.56	74.9
4/10/01 20:13	25.17	74.4

Date And Time	Temperature (° C)	RH (%)
4/10/01 20:15	25.17	74.4
4/10/01 20:17	25.17	74.4
4/10/01 20:19	25.17	74.9
4/10/01 20:21	25.17	74.9
4/10/01 20:23	25.17	75.4
4/10/01 20:25	25.17	74.9
4/10/01 20:27	25.17	75.4
4/10/01 20:29	25.17	74.9
4/10/01 20:31	25.17	74.4
4/10/01 20:33	24.79	74.4
4/10/01 20:35	24.79	74.9
4/10/01 20:37	24.79	74.9
4/10/01 20:39	24.79	75.4
4/10/01 20:41	24.79	75.9
4/10/01 20:43	24.79	76.4
4/10/01 20:45	24.79	76.4
4/10/01 20:47	24.79	76.4
4/10/01 20:49	24.79	77.4
4/10/01 20:51	24.79	77.8
4/10/01 20:53	24.79	78.3
4/10/01 20:55	24.79	76.9
4/10/01 20:57	24.4	77.8
4/10/01 20:59	24.4	78.8
4/10/01 21:01	24.4	78.8
4/10/01 21:03	24.4	77.8
4/10/01 21:05	24.4	78.3
4/10/01 21:07	24.4	78.3
4/10/01 21:09	24.4	78.3
4/10/01 21:11	24.4	77.8
4/10/01 21:13	24.4	77.8
4/10/01 21:15	24.4	79.3
4/10/01 21:17	24.4	79.3
4/10/01 21:19	24.4	78.3
4/10/01 21:21	24.4	78.8
4/10/01 21:23	24.4	78.3
4/10/01 21:25	24.4	78.3
4/10/01 21:27	24.4	79.3
4/10/01 21:29	24.4	78.3
4/10/01 21:31	24.01	79.7
4/10/01 21:33	24.01	79.7
4/10/01 21:35	24.01	79.3
4/10/01 21:37	24.01	79.3
4/10/01 21:39	24.01	79.3
4/10/01 21:41	24.01	78.8
4/10/01 21:43	24.01	78.8
4/10/01 21:45	24.01	78.8
4/10/01 21:47	23.63	79.3
4/10/01 21:49	23.63	79.3
4/10/01 21:51	23.63	79.3
4/10/01 21:53	23.63	79.3

Date And Time	Temperature (° C)	RH (%)
4/10/01 21:55	23.63	78.8
4/10/01 21:57	23.63	79.7
4/10/01 21:59	23.63	80.2
4/10/01 22:01	23.63	81.1
4/10/01 22:03	23.63	81.1
4/10/01 22:05	23.63	81.6
4/10/01 22:07	23.63	82.5
4/10/01 22:09	23.63	83.4
4/10/01 22:11	23.63	83.4
4/10/01 22:13	23.63	83.4
4/10/01 22:15	23.63	83
4/10/01 22:17	23.63	83
4/10/01 22:19	23.63	83
4/10/01 22:21	23.63	83
4/10/01 22:23	23.63	83.4
4/10/01 22:25	23.24	83.4
4/10/01 22:27	23.24	83.4
4/10/01 22:29	23.24	83.9
4/10/01 22:31	23.24	83
4/10/01 22:33	23.24	82.1
4/10/01 22:35	23.24	82.5
4/10/01 22:37	23.24	83.4
4/10/01 22:39	23.24	84.3
4/10/01 22:41	23.24	82.5
4/10/01 22:43	23.24	82.1
4/10/01 22:45	23.24	81.6
4/10/01 22:47	22.86	81.6
4/10/01 22:49	22.86	82.1
4/10/01 22:51	22.86	82.5
4/10/01 22:53	22.86	82.1
4/10/01 22:55	22.48	82.5
4/10/01 22:57	22.48	83
4/10/01 22:59	22.48	83.9
4/10/01 23:01	22.48	83
4/10/01 23:03	22.48	82.5
4/10/01 23:05	22.48	82.5
4/10/01 23:07	22.48	82.5
4/10/01 23:09	22.48	82.5
4/10/01 23:11	22.48	83
4/10/01 23:13	22.48	83
4/10/01 23:15	22.48	83.4
4/10/01 23:17	22.48	83.4
4/10/01 23:19	22.48	83.4
4/10/01 23:21	22.48	83
4/10/01 23:23	22.09	83.4
4/10/01 23:25	22.09	84.3
4/10/01 23:27	22.09	84.3
4/10/01 23:29	22.09	84.8
4/10/01 23:31	22.09	85.2
4/10/01 23:33	22.09	85.2

Date And Time	Temperature (° C)	RH (%)
4/10/01 23:35	22.09	84.3
4/10/01 23:37	22.09	84.8
4/10/01 23:39	22.09	85.2
4/10/01 23:41	22.09	86.1
4/10/01 23:43	22.09	85.2
4/10/01 23:45	22.09	85.2
4/10/01 23:47	22.09	85.2
4/10/01 23:49	22.09	85.7
4/10/01 23:51	22.09	86.6
4/10/01 23:53	22.09	84.3
4/10/01 23:55	22.09	85.2
4/10/01 23:57	22.09	85.2
4/10/01 23:59	22.09	84.3
4/11/01 0:01	22.09	86.6
4/11/01 0:03	22.09	84.8
4/11/01 0:05	22.09	85.2
4/11/01 0:07	22.09	85.7
4/11/01 0:09	22.09	85.7
4/11/01 0:11	22.09	84.3
4/11/01 0:13	22.09	85.7
4/11/01 0:15	22.09	85.2
4/11/01 0:17	22.09	84.8
4/11/01 0:19	22.09	85.2
4/11/01 0:21	22.09	84.3
4/11/01 0:23	22.09	84.3
4/11/01 0:25	22.09	87
4/11/01 0:27	22.09	86.6
4/11/01 0:29	22.09	86.1
4/11/01 0:31	22.09	86.1
4/11/01 0:33	22.09	85.2
4/11/01 0:35	22.09	85.2
4/11/01 0:37	22.09	85.2
4/11/01 0:39	22.09	85.7
4/11/01 0:41	21.71	85.2
4/11/01 0:43	21.71	84.3
4/11/01 0:45	21.71	84.8
4/11/01 0:47	21.71	87
4/11/01 0:49	21.71	86.6
4/11/01 0:51	21.71	86.6
4/11/01 0:53	21.71	85.7
4/11/01 0:55	21.71	85.7
4/11/01 0:57	21.71	86.1
4/11/01 0:59	21.71	86.6
4/11/01 1:01	21.71	85.2
4/11/01 1:03	21.71	86.6
4/11/01 1:05	21.71	85.7
4/11/01 1:07	21.71	86.1
4/11/01 1:09	21.71	86.6
4/11/01 1:11	21.71	87
4/11/01 1:13	21.71	86.1

Date And Time	Temperature (° C)	RH (%)
4/11/01 1:15	21.71	85.7
4/11/01 1:17	21.71	85.7
4/11/01 1:19	21.71	86.1
4/11/01 1:21	21.71	86.6
4/11/01 1:23	21.71	86.6
4/11/01 1:25	21.33	86.1
4/11/01 1:27	21.33	85.7
4/11/01 1:29	21.33	85.7
4/11/01 1:31	21.33	86.1
4/11/01 1:33	21.33	85.7
4/11/01 1:35	21.33	86.6
4/11/01 1:37	21.33	87.4
4/11/01 1:39	21.33	87.4
4/11/01 1:41	21.33	86.6
4/11/01 1:43	21.33	86.6
4/11/01 1:45	21.33	87
4/11/01 1:47	21.33	87.9
4/11/01 1:49	21.33	87
4/11/01 1:51	21.33	87.9
4/11/01 1:53	21.33	86.6
4/11/01 1:55	21.33	87.4
4/11/01 1:57	21.33	87.4
4/11/01 1:59	21.33	87.9
4/11/01 2:01	21.33	87
4/11/01 2:03	21.33	87.9
4/11/01 2:05	21.33	87.9
4/11/01 2:07	21.33	87.4
4/11/01 2:09	20.95	87.4
4/11/01 2:11	20.95	87.4
4/11/01 2:13	20.95	87.4
4/11/01 2:15	20.95	87
4/11/01 2:17	20.95	87.4
4/11/01 2:19	20.95	88.3
4/11/01 2:21	20.95	87.4
4/11/01 2:23	20.95	88.3
4/11/01 2:25	20.95	87.9
4/11/01 2:27	20.95	87.4
4/11/01 2:29	20.95	87.9
4/11/01 2:31	20.95	87.4
4/11/01 2:33	20.95	87.9
4/11/01 2:35	20.57	88.3
4/11/01 2:37	20.57	88.7
4/11/01 2:39	20.57	88.3
4/11/01 2:41	20.57	88.3
4/11/01 2:43	20.57	87.4
4/11/01 2:45	20.57	88.3
4/11/01 2:47	20.57	88.7
4/11/01 2:49	20.57	88.3
4/11/01 2:51	20.57	88.7
4/11/01 2:53	20.57	88.7

Date And Time	Temperature (° C)	RH (%)
4/11/01 2:55	20.57	88.3
4/11/01 2:57	20.57	88.3
4/11/01 2:59	20.57	88.3
4/11/01 3:01	20.57	89.1
4/11/01 3:03	20.57	88.7
4/11/01 3:05	20.57	89.1
4/11/01 3:07	20.57	88.3
4/11/01 3:09	20.57	89.6
4/11/01 3:11	20.57	89.1
4/11/01 3:13	20.57	88.7
4/11/01 3:15	20.57	89.6
4/11/01 3:17	20.57	89.1
4/11/01 3:19	20.57	89.1
4/11/01 3:21	20.19	89.1
4/11/01 3:23	20.19	89.1
4/11/01 3:25	20.19	89.1
4/11/01 3:27	20.19	89.6
4/11/01 3:29	20.19	89.6
4/11/01 3:31	20.19	90
4/11/01 3:33	20.19	89.6
4/11/01 3:35	20.19	89.6
4/11/01 3:37	20.19	90
4/11/01 3:39	20.19	90
4/11/01 3:41	19.81	90
4/11/01 3:43	19.81	89.6
4/11/01 3:45	19.81	90
4/11/01 3:47	19.81	90.4
4/11/01 3:49	19.81	90
4/11/01 3:51	19.81	90
4/11/01 3:53	19.81	90.4
4/11/01 3:55	19.81	90.4
4/11/01 3:57	19.81	90
4/11/01 3:59	19.81	90.8
4/11/01 4:01	19.81	90.4
4/11/01 4:03	19.81	90.4
4/11/01 4:05	19.81	90.8
4/11/01 4:07	19.81	91.2
4/11/01 4:09	19.81	91.2
4/11/01 4:11	19.81	90.8
4/11/01 4:13	19.81	91.2
4/11/01 4:15	19.81	91.6
4/11/01 4:17	19.81	91.2
4/11/01 4:19	19.81	91.2
4/11/01 4:21	19.81	91.2
4/11/01 4:23	19.81	91.2
4/11/01 4:25	19.81	90.8
4/11/01 4:27	19.81	90
4/11/01 4:29	19.81	90.4
4/11/01 4:31	19.81	90
4/11/01 4:33	19.81	90.4

Date And Time	Temperature (° C)	RH (%)
4/11/01 4:35	19.81	90.4
4/11/01 4:37	19.81	90.8
4/11/01 4:39	19.81	90.4
4/11/01 4:41	19.81	90.4
4/11/01 4:43	19.81	90.4
4/11/01 4:45	19.81	90.4
4/11/01 4:47	19.81	90.4
4/11/01 4:49	19.81	90.8
4/11/01 4:51	19.81	90.8
4/11/01 4:53	19.42	90
4/11/01 4:55	19.42	90
4/11/01 4:57	19.42	90.4
4/11/01 4:59	19.42	90.4
4/11/01 5:01	19.42	90.4
4/11/01 5:03	19.42	90.4
4/11/01 5:05	19.42	90.8
4/11/01 5:07	19.42	90
4/11/01 5:09	19.42	90.4
4/11/01 5:11	19.42	90.4
4/11/01 5:13	19.04	90.4
4/11/01 5:15	19.04	90.8
4/11/01 5:17	19.04	91.2
4/11/01 5:19	19.04	92
4/11/01 5:21	19.04	92
4/11/01 5:23	19.04	92
4/11/01 5:25	19.42	91.6
4/11/01 5:27	19.42	91.6
4/11/01 5:29	19.04	90.8
4/11/01 5:31	19.04	91.2
4/11/01 5:33	19.04	91.2
4/11/01 5:35	19.04	91.2
4/11/01 5:37	19.04	91.6
4/11/01 5:39	19.04	91.2
4/11/01 5:41	19.04	91.6
4/11/01 5:43	19.04	90.8
4/11/01 5:45	19.04	91.6
4/11/01 5:47	19.04	91.6
4/11/01 5:49	19.04	91.6
4/11/01 5:51	19.04	91.2
4/11/01 5:53	19.04	92
4/11/01 5:55	19.04	91.6
4/11/01 5:57	19.04	90.4
4/11/01 5:59	19.04	90.4
4/11/01 6:01	19.04	90
4/11/01 6:03	18.66	90.8
4/11/01 6:05	18.66	91.2
4/11/01 6:07	18.66	90.8
4/11/01 6:09	18.66	91.6
4/11/01 6:11	18.66	91.2
4/11/01 6:13	18.66	91.6

Date And Time	Temperature (° C)	RH (%)
4/11/01 6:15	18.66	91.6
4/11/01 6:17	18.66	92.4
4/11/01 6:19	18.66	92.4
4/11/01 6:21	18.66	91.6
4/11/01 6:23	18.66	91.2
4/11/01 6:25	18.66	91.2
4/11/01 6:27	18.66	91.2
4/11/01 6:29	18.66	91.2
4/11/01 6:31	18.66	90.8
4/11/01 6:33	18.66	91.2
4/11/01 6:35	18.66	91.6
4/11/01 6:37	18.66	91.2
4/11/01 6:39	18.66	91.2
4/11/01 6:41	18.66	91.6
4/11/01 6:43	18.66	90.8
4/11/01 6:45	18.66	90.8
4/11/01 6:47	18.66	90.8
4/11/01 6:49	18.66	90.8
4/11/01 6:51	18.66	91.2
4/11/01 6:53	18.66	90.8
4/11/01 6:55	18.66	90.8
4/11/01 6:57	18.66	91.2
4/11/01 6:59	18.66	91.2
4/11/01 7:01	18.66	91.2
4/11/01 7:03	18.66	91.2
4/11/01 7:05	18.66	91.2
4/11/01 7:07	18.66	91.6
4/11/01 7:09	18.66	91.6
4/11/01 7:11	18.66	92
4/11/01 7:13	18.66	92
4/11/01 7:15	18.66	92
4/11/01 7:17	18.66	92
4/11/01 7:19	18.66	92
4/11/01 7:21	18.66	93.2
4/11/01 7:23	18.66	92.4
4/11/01 7:25	18.66	92
4/11/01 7:27	19.04	92.4
4/11/01 7:29	19.04	92
4/11/01 7:31	19.04	92
4/11/01 7:33	19.04	92.4
4/11/01 7:35	19.04	92.4
4/11/01 7:37	19.04	92.8
4/11/01 7:39	19.04	94
4/11/01 7:41	19.04	94
4/11/01 7:43	19.04	94.4
4/11/01 7:45	19.04	94
4/11/01 7:47	19.04	93.2
4/11/01 7:49	19.42	92.8
4/11/01 7:51	19.42	93.2
4/11/01 7:53	19.42	92.8

Date And Time	Temperature (° C)	RH (%)
4/11/01 7:55	19.42	92.8
4/11/01 7:57	19.42	92.8
4/11/01 7:59	19.42	93.2
4/11/01 8:01	19.42	92.8
4/11/01 8:03	19.42	92
4/11/01 8:05	19.42	92.4
4/11/01 8:07	19.42	92.4
4/11/01 8:09	19.81	92.4
4/11/01 8:11	19.81	92.8
4/11/01 8:13	19.81	92
4/11/01 8:15	19.81	91.6
4/11/01 8:17	19.81	91.6
4/11/01 8:19	19.81	91.6
4/11/01 8:21	20.19	91.6
4/11/01 8:23	20.19	92
4/11/01 8:25	20.19	92
4/11/01 8:27	20.19	91.6
4/11/01 8:29	20.19	91.6
4/11/01 8:31	20.57	92.4
4/11/01 8:33	20.57	91.6
4/11/01 8:35	20.57	92
4/11/01 8:37	20.57	92
4/11/01 8:39	20.95	90.8
4/11/01 8:41	20.95	90.8
4/11/01 8:43	20.95	89.1
4/11/01 8:45	21.33	90.4
4/11/01 8:47	21.33	90.8
4/11/01 8:49	21.33	90
4/11/01 8:51	21.33	90
4/11/01 8:53	21.33	89.1
4/11/01 8:55	21.33	88.7
4/11/01 8:57	21.33	87.9
4/11/01 8:59	21.71	88.7
4/11/01 9:01	21.71	88.3
4/11/01 9:03	21.71	91.2
4/11/01 9:05	22.09	90.8
4/11/01 9:07	22.09	87.9
4/11/01 9:09	22.09	85.7
4/11/01 9:11	22.48	84.3
4/11/01 9:13	22.48	84.3
4/11/01 9:15	22.48	83.9
4/11/01 9:17	22.86	86.6
4/11/01 9:19	22.86	84.8
4/11/01 9:21	22.86	84.3
4/11/01 9:23	22.86	83.4
4/11/01 9:25	22.86	83.9
4/11/01 9:27	23.24	84.3
4/11/01 9:29	23.24	84.3
4/11/01 9:31	22.86	83.9
4/11/01 9:33	22.86	83.4

Date And Time	Temperature (° C)	RH (%)
4/11/01 9:35	22.86	83.4
4/11/01 9:37	22.86	83.9
4/11/01 9:39	22.86	84.8
4/11/01 9:41	22.86	86.6
4/11/01 9:43	22.86	86.6
4/11/01 9:45	22.86	85.7
4/11/01 9:47	22.86	85.2
4/11/01 9:49	22.86	83.9
4/11/01 9:51	23.24	84.8
4/11/01 9:53	23.63	84.8
4/11/01 9:55	24.4	87.4
4/11/01 9:57	25.17	83.4
4/11/01 9:59	25.56	84.3
4/11/01 10:01	26.34	81.6
4/11/01 10:03	26.73	77.8
4/11/01 10:05	26.34	74.9
4/11/01 10:07	26.34	75.4
4/11/01 10:09	27.12	76.4
4/11/01 10:11	27.12	73
4/11/01 10:13	27.12	72.5
4/11/01 10:15	27.52	74
4/11/01 10:17	27.52	74.9
4/11/01 10:19	27.52	74.4
4/11/01 10:21	27.52	72.5
4/11/01 10:23	27.52	67.5
4/11/01 10:25	28.31	66.4
4/11/01 10:27	29.5	67.5
4/11/01 10:29	29.5	67.5
4/11/01 10:31	29.9	65.4
4/11/01 10:33	30.31	66.4
4/11/01 10:35	31.52	69
4/11/01 10:37	32.34	68
4/11/01 10:39	32.34	67.5
4/11/01 10:41	33.17	68
4/11/01 10:43	32.76	66.4
4/11/01 10:45	33.17	62.9
4/11/01 10:47	33.17	64.9
4/11/01 10:49	33.59	68
4/11/01 10:51	34.01	65.9
4/11/01 10:53	33.17	59.8
4/11/01 10:55	32.34	60.3
4/11/01 10:57	31.52	58.2
4/11/01 10:59	31.12	57.2
4/11/01 11:01	30.71	62.9
4/11/01 11:03	31.52	61.8
4/11/01 11:05	31.52	56.7
4/11/01 11:07	31.52	60.3
4/11/01 11:09	31.52	57.2
4/11/01 11:11	31.52	55.1
4/11/01 11:13	31.52	60.3

Date And Time	Temperature (º C)	RH (%)
4/11/01 11:15	31.52	61.3
4/11/01 11:17	31.52	56.7
4/11/01 11:19	31.52	57.2
4/11/01 11:21	31.12	55.1
4/11/01 11:23	31.12	54.1
4/11/01 11:25	31.52	62.9
4/11/01 11:27	31.52	55.1
4/11/01 11:29	31.52	54.1
4/11/01 11:31	31.12	55.1
4/11/01 11:33	31.12	51.5
4/11/01 11:35	30.71	55.1
4/11/01 11:37	30.71	53
4/11/01 11:39	30.71	55.1
4/11/01 11:41	30.31	53.6
4/11/01 11:43	30.31	56.7
4/11/01 11:45	30.31	60.8
4/11/01 11:47	30.31	53
4/11/01 11:49	30.31	51
4/11/01 11:51	30.31	56.2
4/11/01 11:53	29.9	56.2
4/11/01 11:55	29.9	54.1
4/11/01 11:57	29.9	51.5
4/11/01 11:59	29.9	52
4/11/01 12:01	29.9	50.5
4/11/01 12:03	29.9	51.5
4/11/01 12:05	29.5	50.5
4/11/01 12:07	29.5	49.9
4/11/01 12:09	29.5	46.8
4/11/01 12:11	29.5	51.5
4/11/01 12:13	29.9	48.9
4/11/01 12:15	29.9	47.9
4/11/01 12:17	29.9	48.9
4/11/01 12:19	29.9	46.8
4/11/01 12:21	30.31	49.4
4/11/01 12:23	30.31	44.8
4/11/01 12:25	30.31	55.1
4/11/01 12:27	30.31	49.4
4/11/01 12:29	30.31	44.8
4/11/01 12:31	30.31	53
4/11/01 12:33	30.31	44.3
4/11/01 12:35	30.31	48.9
4/11/01 12:37	30.31	42.7
4/11/01 12:39	30.31	46.3
4/11/01 12:41	30.31	50.5
4/11/01 12:43	30.31	43.8
4/11/01 12:45	30.31	45.3
4/11/01 12:47	30.71	54.1
4/11/01 12:49	30.31	41.7
4/11/01 12:51	30.31	49.9
4/11/01 12:53	30.31	45.8

Date And Time	Temperature (° C)	RH (%)
4/11/01 12:55	29.9	38.7
4/11/01 12:57	29.9	42.7
4/11/01 12:59	29.9	53.6
4/11/01 13:01	29.5	43.8
4/11/01 13:03	29.5	43.8
4/11/01 13:05	29.5	49.4
4/11/01 13:07	29.5	48.9
4/11/01 13:09	29.5	49.9
4/11/01 13:11	29.5	55.1
4/11/01 13:13	29.5	51
4/11/01 13:15	29.5	45.3
4/11/01 13:17	29.5	46.3
4/11/01 13:19	29.5	57.2
4/11/01 13:21	29.5	55.1
4/11/01 13:23	29.5	50.5
4/11/01 13:25	29.5	52.5
4/11/01 13:27	29.5	53
4/11/01 13:29	29.5	53
4/11/01 13:31	29.5	48.9
4/11/01 13:33	29.5	58.2
4/11/01 13:35	29.5	54.1
4/11/01 13:37	29.5	49.4
4/11/01 13:39	29.5	47.4
4/11/01 13:41	29.5	55.1
4/11/01 13:43	29.5	60.8
4/11/01 13:45	29.5	49.9
4/11/01 13:47	29.5	44.8
4/11/01 13:49	29.1	42.7
4/11/01 13:51	29.1	46.8
4/11/01 13:53	29.1	45.3
4/11/01 13:55	29.1	47.9
4/11/01 13:57	29.1	49.9
4/11/01 13:59	29.1	48.4
4/11/01 14:01	29.1	46.3
4/11/01 14:03	29.1	45.3
4/11/01 14:05	29.1	64.4
4/11/01 14:07	29.1	51.5
4/11/01 14:09	29.1	47.9
4/11/01 14:11	29.1	45.3
4/11/01 14:13	29.1	52.5
4/11/01 14:15	29.1	43.8
4/11/01 14:17	29.1	49.9
4/11/01 14:19	29.1	54.6
4/11/01 14:21	29.1	45.3
4/11/01 14:23	29.1	45.3
4/11/01 14:25	29.1	54.1
4/11/01 14:27	29.1	58.2
4/11/01 14:29	29.1	52
4/11/01 14:31	29.1	54.1
4/11/01 14:33	29.1	48.9

Date And Time	Temperature (° C)	RH (%)
4/11/01 14:35	29.5	52.5
4/11/01 14:37	29.5	48.9
4/11/01 14:39	29.5	45.3
4/11/01 14:41	29.1	55.6
4/11/01 14:43	29.1	59.8
4/11/01 14:45	29.1	48.4
4/11/01 14:47	29.5	47.9
4/11/01 14:49	29.5	55.1
4/11/01 14:51	29.5	61.3
4/11/01 14:53	29.5	55.1
4/11/01 14:55	29.5	54.1
4/11/01 14:57	29.5	51
4/11/01 14:59	29.5	45.8
4/11/01 15:01	29.5	52
4/11/01 15:03	29.5	53.6
4/11/01 15:05	29.5	54.1
4/11/01 15:07	29.1	56.2
4/11/01 15:09	29.1	49.4
4/11/01 15:11	29.1	50.5
4/11/01 15:13	29.1	53
4/11/01 15:15	29.1	49.9
4/11/01 15:17	29.1	47.9
4/11/01 15:19	28.7	43.8
4/11/01 15:21	28.7	51
4/11/01 15:23	28.7	48.9
4/11/01 15:25	29.1	53
4/11/01 15:27	29.1	52
4/11/01 15:29	29.1	55.6
4/11/01 15:31	29.1	53
4/11/01 15:33	29.1	50.5
4/11/01 15:35	29.1	49.9
4/11/01 15:37	28.7	45.3
4/11/01 15:39	28.7	46.8
4/11/01 15:41	28.7	46.8
4/11/01 15:43	28.7	44.3
4/11/01 15:45	28.7	55.1
4/11/01 15:47	28.7	46.3
4/11/01 15:49	29.1	45.8
4/11/01 15:51	29.1	49.4
4/11/01 15:53	29.1	50.5
4/11/01 15:55	28.7	53.6
4/11/01 15:57	28.7	44.8
4/11/01 15:59	28.7	54.6
4/11/01 16:01	28.7	47.9
4/11/01 16:03	28.7	47.4
4/11/01 16:05	28.7	49.9
4/11/01 16:07	28.7	62.9
4/11/01 16:09	28.7	57.2
4/11/01 16:11	28.7	47.9
4/11/01 16:13	28.7	45.3

Date And Time	Temperature (° C)	RH (%)
4/11/01 16:15	28.7	54.6
4/11/01 16:17	28.7	53
4/11/01 16:19	28.7	46.8
4/11/01 16:21	28.7	46.8
4/11/01 16:23	28.7	57.7
4/11/01 16:25	28.7	47.4
4/11/01 16:27	28.7	49.4
4/11/01 16:29	28.7	59.8
4/11/01 16:31	28.7	52
4/11/01 16:33	28.7	53.6
4/11/01 16:35	28.7	53
4/11/01 16:37	28.7	49.9
4/11/01 16:39	28.7	62.9
4/11/01 16:41	28.7	55.6
4/11/01 16:43	28.7	59.8
4/11/01 16:45	28.7	53.6
4/11/01 16:47	28.31	57.7
4/11/01 16:49	28.31	50.5
4/11/01 16:51	28.31	54.6
4/11/01 16:53	28.31	54.1
4/11/01 16:55	28.31	54.1
4/11/01 16:57	28.31	58.2
4/11/01 16:59	28.31	57.2
4/11/01 17:01	28.31	62.4
4/11/01 17:03	27.91	60.8
4/11/01 17:05	27.91	54.1
4/11/01 17:07	27.91	58.7
4/11/01 17:09	27.91	56.7
4/11/01 17:11	27.91	55.1
4/11/01 17:13	27.91	61.3
4/11/01 17:15	28.31	59.8
4/11/01 17:17	27.91	51
4/11/01 17:19	27.91	53
4/11/01 17:21	27.91	51.5
4/11/01 17:23	27.91	49.4
4/11/01 17:25	27.91	55.6
4/11/01 17:27	27.91	55.6
4/11/01 17:29	27.91	56.7
4/11/01 17:31	27.91	54.1
4/11/01 17:33	27.91	55.6
4/11/01 17:35	27.52	56.2
4/11/01 17:37	27.52	58.2
4/11/01 17:39	27.52	64.9
4/11/01 17:41	27.52	60.8
4/11/01 17:43	27.52	54.6
4/11/01 17:45	27.52	57.7
4/11/01 17:47	27.52	53.6
4/11/01 17:49	27.52	59.3
4/11/01 17:51	27.52	56.7
4/11/01 17:53	27.52	54.6

Date And Time	Temperature (° C)	RH (%)
4/11/01 17:55	27.52	60.3
4/11/01 17:57	27.12	56.2
4/11/01 17:59	27.12	61.8
4/11/01 18:01	27.12	56.2
4/11/01 18:03	27.12	59.3
4/11/01 18:05	27.12	54.6
4/11/01 18:07	27.12	58.2
4/11/01 18:09	27.12	57.2
4/11/01 18:11	26.73	58.2
4/11/01 18:13	26.73	60.8
4/11/01 18:15	26.73	57.2
4/11/01 18:17	26.73	58.2
4/11/01 18:19	26.73	57.2
4/11/01 18:21	26.73	59.8
4/11/01 18:23	26.73	56.7
4/11/01 18:25	26.73	55.1
4/11/01 18:27	26.73	59.3
4/11/01 18:29	26.34	55.6
4/11/01 18:31	26.34	59.8
4/11/01 18:33	26.34	59.8
4/11/01 18:35	26.34	58.2
4/11/01 18:37	26.34	62.4
4/11/01 18:39	26.34	61.3
4/11/01 18:41	26.34	60.8
4/11/01 18:43	26.34	61.3
4/11/01 18:45	26.34	57.7
4/11/01 18:47	26.34	59.8
4/11/01 18:49	26.34	59.8
4/11/01 18:51	26.34	61.8
4/11/01 18:53	26.34	62.4
4/11/01 18:55	25.95	57.7
4/11/01 18:57	25.95	61.3
4/11/01 18:59	25.95	65.4
4/11/01 19:01	25.95	60.3
4/11/01 19:03	25.95	60.3
4/11/01 19:05	25.95	61.8
4/11/01 19:07	25.95	61.3
4/11/01 19:09	25.95	58.7
4/11/01 19:11	25.56	61.3
4/11/01 19:13	25.56	60.3
4/11/01 19:15	25.56	61.8
4/11/01 19:17	25.56	64.9
4/11/01 19:19	25.56	61.8
4/11/01 19:21	25.56	60.3
4/11/01 19:23	25.17	59.3
4/11/01 19:25	25.17	59.8
4/11/01 19:27	25.17	60.8
4/11/01 19:29	25.17	60.3
4/11/01 19:31	24.79	60.8
4/11/01 19:33	24.79	60.3

Date And Time	Temperature (° C)	RH (%)
4/11/01 19:35	24.79	61.3
4/11/01 19:37	24.79	61.3
4/11/01 19:39	24.79	60.8
4/11/01 19:41	24.79	61.8
4/11/01 19:43	24.79	63.4
4/11/01 19:45	24.79	62.9
4/11/01 19:47	24.4	61.8
4/11/01 19:49	24.4	64.9
4/11/01 19:51	24.4	64.9
4/11/01 19:53	24.4	64.9
4/11/01 19:55	24.4	64.9
4/11/01 19:57	24.4	67.5
4/11/01 19:59	24.4	65.9
4/11/01 20:01	24.4	64.9
4/11/01 20:03	24.4	63.9
4/11/01 20:05	24.4	64.9
4/11/01 20:07	24.4	65.4
4/11/01 20:09	24.4	65.4
4/11/01 20:11	24.01	64.9
4/11/01 20:13	24.01	64.9
4/11/01 20:15	24.01	64.9
4/11/01 20:17	24.01	65.4
4/11/01 20:19	24.01	64.9
4/11/01 20:21	24.01	64.9
4/11/01 20:23	24.01	65.4
4/11/01 20:25	24.01	65.9
4/11/01 20:27	24.01	67
4/11/01 20:29	24.01	65.4
4/11/01 20:31	24.01	65.9
4/11/01 20:33	23.63	65.9
4/11/01 20:35	23.63	65.9
4/11/01 20:37	23.63	65.9
4/11/01 20:39	23.63	66.4
4/11/01 20:41	23.63	67
4/11/01 20:43	23.24	67.5
4/11/01 20:45	23.24	67.5
4/11/01 20:47	23.24	68
4/11/01 20:49	23.24	68.5
4/11/01 20:51	23.24	68
4/11/01 20:53	22.86	68.5
4/11/01 20:55	22.86	69
4/11/01 20:57	22.86	68.5
4/11/01 20:59	22.86	69
4/11/01 21:01	22.86	69
4/11/01 21:03	22.86	69
4/11/01 21:05	22.48	70
4/11/01 21:07	22.48	70.5
4/11/01 21:09	22.48	70.5
4/11/01 21:11	22.48	71
4/11/01 21:13	22.48	71.5

Date And Time	Temperature (° C)	RH (%)
4/11/01 21:15	22.48	70.5
4/11/01 21:17	22.48	71.5
4/11/01 21:19	22.09	71
4/11/01 21:21	22.09	71.5
4/11/01 21:23	22.09	71.5
4/11/01 21:25	22.09	72
4/11/01 21:27	22.09	73
4/11/01 21:29	22.09	73
4/11/01 21:31	22.09	73.5
4/11/01 21:33	22.09	73.5
4/11/01 21:35	22.09	73.5
4/11/01 21:37	22.09	73.5
4/11/01 21:39	22.09	74.4
4/11/01 21:41	22.09	74.4
4/11/01 21:43	22.09	74.4
4/11/01 21:45	22.09	74.4
4/11/01 21:47	22.09	74
4/11/01 21:49	22.09	74.4
4/11/01 21:51	21.71	74.4
4/11/01 21:53	21.71	74.4
4/11/01 21:55	21.71	74.4
4/11/01 21:57	21.71	75.4
4/11/01 21:59	21.71	75.9
4/11/01 22:01	21.71	75.4
4/11/01 22:03	21.71	75.4
4/11/01 22:05	21.71	75.9
4/11/01 22:07	21.71	75.9
4/11/01 22:09	21.71	75.4
4/11/01 22:11	21.71	75.4
4/11/01 22:13	21.71	75.4
4/11/01 22:15	21.71	75.9
4/11/01 22:17	21.71	76.9
4/11/01 22:19	21.71	76.9
4/11/01 22:21	21.71	77.4
4/11/01 22:23	21.71	77.4
4/11/01 22:25	21.33	77.8
4/11/01 22:27	21.33	78.3
4/11/01 22:29	21.33	78.3
4/11/01 22:31	21.33	78.3
4/11/01 22:33	21.33	78.8
4/11/01 22:35	21.33	78.3
4/11/01 22:37	21.33	78.3
4/11/01 22:39	21.33	78.3
4/11/01 22:41	21.33	78.8
4/11/01 22:43	21.33	79.3
4/11/01 22:45	21.33	78.8
4/11/01 22:47	20.95	78.8
4/11/01 22:49	20.95	78.8
4/11/01 22:51	20.95	78.8
4/11/01 22:53	20.95	78.8

Date And Time	Temperature (° C)	RH (%)
4/11/01 22:55	20.95	79.3
4/11/01 22:57	20.95	79.3
4/11/01 22:59	20.95	79.7
4/11/01 23:01	20.95	79.7
4/11/01 23:03	20.95	80.2
4/11/01 23:05	20.95	80.2
4/11/01 23:07	20.95	80.7
4/11/01 23:09	20.95	80.7
4/11/01 23:11	20.95	81.1
4/11/01 23:13	20.95	80.2
4/11/01 23:15	20.95	80.2
4/11/01 23:17	20.95	79.3
4/11/01 23:19	20.95	79.7
4/11/01 23:21	20.95	79.7
4/11/01 23:23	20.95	79.7
4/11/01 23:25	20.95	80.2
4/11/01 23:27	20.95	80.7
4/11/01 23:29	20.57	79.7
4/11/01 23:31	20.57	79.7
4/11/01 23:33	20.57	80.7
4/11/01 23:35	20.19	81.1
4/11/01 23:37	20.19	81.6
4/11/01 23:39	20.19	81.6
4/11/01 23:41	20.19	81.1
4/11/01 23:43	20.19	81.1
4/11/01 23:45	20.19	81.1
4/11/01 23:47	20.19	81.1
4/11/01 23:49	20.19	81.6
4/11/01 23:51	20.19	81.1
4/11/01 23:53	20.19	81.6
4/11/01 23:55	20.19	81.6
4/11/01 23:57	20.19	82.1
4/11/01 23:59	19.81	81.6
4/12/01 0:01	19.81	81.6
4/12/01 0:03	19.81	81.6
4/12/01 0:05	19.81	81.6
4/12/01 0:07	19.81	81.6
4/12/01 0:09	19.81	81.6
4/12/01 0:11	19.81	82.5
4/12/01 0:13	19.81	82.1
4/12/01 0:15	19.81	82.5
4/12/01 0:17	19.81	81.1
4/12/01 0:19	19.81	81.6
4/12/01 0:21	19.81	83
4/12/01 0:23	19.81	82.1
4/12/01 0:25	19.81	82.1
4/12/01 0:27	19.81	82.1
4/12/01 0:29	19.81	82.1
4/12/01 0:31	19.81	81.6
4/12/01 0:33	19.81	81.6

Date And Time	Temperature (° C)	RH (%)
4/12/01 0:35	19.81	81.6
4/12/01 0:37	19.81	80.7
4/12/01 0:39	19.81	81.1
4/12/01 0:41	19.81	80.2
4/12/01 0:43	19.81	80.2
4/12/01 0:45	19.81	80.7
4/12/01 0:47	19.81	80.7
4/12/01 0:49	19.81	81.1
4/12/01 0:51	19.81	80.7
4/12/01 0:53	19.81	81.1
4/12/01 0:55	19.81	81.1
4/12/01 0:57	19.81	81.1
4/12/01 0:59	19.42	81.1
4/12/01 1:01	19.42	81.6
4/12/01 1:03	19.42	81.6
4/12/01 1:05	19.42	82.1
4/12/01 1:07	19.42	82.5
4/12/01 1:09	19.42	82.5
4/12/01 1:11	19.42	83
4/12/01 1:13	19.42	82.5
4/12/01 1:15	19.42	82.1
4/12/01 1:17	19.42	82.1
4/12/01 1:19	19.42	82.5
4/12/01 1:21	19.42	83
4/12/01 1:23	19.42	83.4
4/12/01 1:25	19.42	83.4
4/12/01 1:27	19.42	83.4
4/12/01 1:29	19.42	83
4/12/01 1:31	19.04	83.4
4/12/01 1:33	19.04	83.4
4/12/01 1:35	19.04	83.9
4/12/01 1:37	19.04	84.3
4/12/01 1:39	19.04	84.3
4/12/01 1:41	19.04	83.9
4/12/01 1:43	19.04	83.9
4/12/01 1:45	18.66	84.3
4/12/01 1:47	18.66	84.8
4/12/01 1:49	18.66	84.3
4/12/01 1:51	18.66	84.3
4/12/01 1:53	18.66	83.9
4/12/01 1:55	18.66	83.9
4/12/01 1:57	18.66	82.5
4/12/01 1:59	19.04	82.1
4/12/01 2:01	19.04	83
4/12/01 2:03	19.04	83.4
4/12/01 2:05	18.66	83.9
4/12/01 2:07	18.66	83.9
4/12/01 2:09	18.66	83.9
4/12/01 2:11	18.66	84.3
4/12/01 2:13	18.66	84.3

Date And Time	Temperature (° C)	RH (%)
4/12/01 2:15	18.66	84.8
4/12/01 2:17	18.66	84.3
4/12/01 2:19	18.66	84.3
4/12/01 2:21	18.66	84.8
4/12/01 2:23	18.28	85.7
4/12/01 2:25	18.28	86.1
4/12/01 2:27	18.28	86.1
4/12/01 2:29	18.28	86.1
4/12/01 2:31	18.28	85.7
4/12/01 2:33	18.28	85.7
4/12/01 2:35	18.28	84.8
4/12/01 2:37	18.28	84.8
4/12/01 2:39	18.28	84.3
4/12/01 2:41	18.28	84.8
4/12/01 2:43	18.28	84.3
4/12/01 2:45	18.28	84.3
4/12/01 2:47	18.28	84.8
4/12/01 2:49	18.28	84.3
4/12/01 2:51	18.28	84.8
4/12/01 2:53	18.28	85.2
4/12/01 2:55	18.28	85.2
4/12/01 2:57	18.28	85.2
4/12/01 2:59	18.28	85.2
4/12/01 3:01	18.28	85.2
4/12/01 3:03	17.9	85.7
4/12/01 3:05	17.9	85.7
4/12/01 3:07	17.9	85.7
4/12/01 3:09	17.9	85.7
4/12/01 3:11	17.9	86.1
4/12/01 3:13	17.9	86.1
4/12/01 3:15	17.9	86.1
4/12/01 3:17	17.9	86.1
4/12/01 3:19	17.9	85.7
4/12/01 3:21	17.9	86.1
4/12/01 3:23	17.9	86.1
4/12/01 3:25	17.9	85.7
4/12/01 3:27	17.9	85.7
4/12/01 3:29	17.9	86.1
4/12/01 3:31	17.9	86.1
4/12/01 3:33	17.9	86.1
4/12/01 3:35	17.9	86.1
4/12/01 3:37	17.9	86.6
4/12/01 3:39	17.9	86.6
4/12/01 3:41	17.9	86.6
4/12/01 3:43	17.9	87
4/12/01 3:45	17.9	87
4/12/01 3:47	17.9	87
4/12/01 3:49	17.9	87
4/12/01 3:51	17.9	87
4/12/01 3:53	17.9	87.9

Date And Time	Temperature (° C)	RH (%)
4/12/01 3:55	17.9	87.4
4/12/01 3:57	17.9	87.4
4/12/01 3:59	17.9	87.4
4/12/01 4:01	17.9	87.4
4/12/01 4:03	17.9	87.4
4/12/01 4:05	17.9	88.3
4/12/01 4:07	17.9	87.9
4/12/01 4:09	18.28	88.3
4/12/01 4:11	18.28	88.3
4/12/01 4:13	18.28	88.3
4/12/01 4:15	18.28	87.9
4/12/01 4:17	18.28	87.9
4/12/01 4:19	18.28	87.9
4/12/01 4:21	18.28	87.9
4/12/01 4:23	18.28	88.3
4/12/01 4:25	18.28	88.3
4/12/01 4:27	18.28	88.3
4/12/01 4:29	18.28	88.3
4/12/01 4:31	18.28	88.7
4/12/01 4:33	18.28	88.7
4/12/01 4:35	18.28	88.7
4/12/01 4:37	18.28	88.7
4/12/01 4:39	18.28	88.7
4/12/01 4:41	18.66	88.7
4/12/01 4:43	18.66	88.7
4/12/01 4:45	18.66	88.7
4/12/01 4:47	18.66	88.7
4/12/01 4:49	18.66	88.7
4/12/01 4:51	18.66	88.7
4/12/01 4:53	18.66	88.7
4/12/01 4:55	18.66	88.7
4/12/01 4:57	18.66	88.7
4/12/01 4:59	18.66	88.7
4/12/01 5:01	18.66	88.7
4/12/01 5:03	18.66	89.1
4/12/01 5:05	18.66	89.1
4/12/01 5:07	18.66	89.1
4/12/01 5:09	18.66	89.1
4/12/01 5:11	18.66	89.1
4/12/01 5:13	18.66	89.1
4/12/01 5:15	18.66	89.1
4/12/01 5:17	18.66	90
4/12/01 5:19	18.66	90.4
4/12/01 5:21	18.66	90.4
4/12/01 5:23	18.66	90
4/12/01 5:25	18.66	90.4
4/12/01 5:27	18.66	90
4/12/01 5:29	18.66	90
4/12/01 5:31	18.66	90.4
4/12/01 5:33	18.66	90.4

Date And Time	Temperature (° C)	RH (%)
4/12/01 5:35	18.66	90.4
4/12/01 5:37	18.66	90.4
4/12/01 5:39	19.04	90.4
4/12/01 5:41	19.04	90.8
4/12/01 5:43	18.66	90.8
4/12/01 5:45	18.66	90.4
4/12/01 5:47	18.66	90.4
4/12/01 5:49	18.66	90.4
4/12/01 5:51	18.66	90.4
4/12/01 5:53	18.66	90.4
4/12/01 5:55	18.66	90.4
4/12/01 5:57	18.66	90.4
4/12/01 5:59	18.66	91.2
4/12/01 6:01	18.66	91.2
4/12/01 6:03	18.66	90.8
4/12/01 6:05	18.66	90.8
4/12/01 6:07	18.66	90.8
4/12/01 6:09	18.66	90.8
4/12/01 6:11	19.04	91.2
4/12/01 6:13	19.04	91.2
4/12/01 6:15	19.04	91.2
4/12/01 6:17	19.04	91.2
4/12/01 6:19	19.04	91.6
4/12/01 6:21	19.04	91.6
4/12/01 6:23	19.04	92
4/12/01 6:25	19.04	92
4/12/01 6:27	19.04	92
4/12/01 6:29	19.04	92.4
4/12/01 6:31	19.04	92.4
4/12/01 6:33	19.04	92.4
4/12/01 6:35	19.04	92.4
4/12/01 6:37	19.04	92.4
4/12/01 6:39	19.04	92.4
4/12/01 6:41	19.04	92.4
4/12/01 6:43	19.04	92.8
4/12/01 6:45	19.04	92.8
4/12/01 6:47	19.04	92.8
4/12/01 6:49	19.04	92.8
4/12/01 6:51	19.04	92.8
4/12/01 6:53	19.04	93.2
4/12/01 6:55	19.04	93.2
4/12/01 6:57	19.42	93.2
4/12/01 6:59	19.04	93.2
4/12/01 7:01	19.42	93.2
4/12/01 7:03	19.42	93.2
4/12/01 7:05	19.42	93.2
4/12/01 7:07	19.42	93.2
4/12/01 7:09	19.42	93.6
4/12/01 7:11	19.42	93.2
4/12/01 7:13	19.42	93.6

Date And Time	Temperature (° C)	RH (%)
4/12/01 7:15	19.42	93.2
4/12/01 7:17	19.42	93.6
4/12/01 7:19	19.42	93.6
4/12/01 7:21	19.42	93.6
4/12/01 7:23	19.42	93.6
4/12/01 7:25	19.42	93.2
4/12/01 7:27	19.42	93.2
4/12/01 7:29	19.42	93.2
4/12/01 7:31	19.42	93.6
4/12/01 7:33	19.42	93.6
4/12/01 7:35	19.42	93.6
4/12/01 7:37	19.42	93.6
4/12/01 7:39	19.42	93.6
4/12/01 7:41	19.42	93.6
4/12/01 7:43	19.42	94
4/12/01 7:45	19.42	94
4/12/01 7:47	19.42	94
4/12/01 7:49	19.42	94.4
4/12/01 7:51	19.81	94.4
4/12/01 7:53	19.81	94
4/12/01 7:55	19.81	94
4/12/01 7:57	19.81	94
4/12/01 7:59	19.81	94.4
4/12/01 8:01	19.81	94.4
4/12/01 8:03	19.81	94.4
4/12/01 8:05	19.81	94.4
4/12/01 8:07	19.81	94.4
4/12/01 8:09	19.81	94
4/12/01 8:11	19.81	94.4
4/12/01 8:13	19.81	94
4/12/01 8:15	19.81	94
4/12/01 8:17	19.81	94
4/12/01 8:19	19.81	94.4
4/12/01 8:21	19.81	94
4/12/01 8:23	19.81	94
4/12/01 8:25	20.19	94.4
4/12/01 8:27	20.19	94.4
4/12/01 8:29	20.19	94.4
4/12/01 8:31	20.19	94.8
4/12/01 8:33	20.19	94.4
4/12/01 8:35	20.19	94.4
4/12/01 8:37	20.19	94.4
4/12/01 8:39	20.19	94.4
4/12/01 8:41	20.19	94.8
4/12/01 8:43	20.19	94.8
4/12/01 8:45	20.19	94.4
4/12/01 8:47	20.57	94.4
4/12/01 8:49	20.57	94.4
4/12/01 8:51	20.57	94.4
4/12/01 8:53	20.57	94

Date And Time	Temperature (° C)	RH (%)
4/12/01 8:55	20.57	94
4/12/01 8:57	20.95	94.4
4/12/01 8:59	20.95	94
4/12/01 9:01	20.95	93.2
4/12/01 9:03	21.33	93.2
4/12/01 9:05	21.33	93.2
4/12/01 9:07	21.33	92.8
4/12/01 9:09	21.33	92.4
4/12/01 9:11	21.33	92
4/12/01 9:13	21.71	91.6
4/12/01 9:15	22.09	90
4/12/01 9:17	22.86	87.4
4/12/01 9:19	23.63	84.8
4/12/01 9:21	24.4	83
4/12/01 9:23	24.79	81.6
4/12/01 9:25	25.56	80.7
4/12/01 9:27	25.95	80.7
4/12/01 9:29	26.34	79.7
4/12/01 9:31	26.34	77.4
4/12/01 9:33	26.34	78.3
4/12/01 9:35	26.34	77.4
4/12/01 9:37	26.73	75.9
4/12/01 9:39	26.73	77.4
4/12/01 9:41	26.34	77.8
4/12/01 9:43	26.73	76.4
4/12/01 9:45	26.73	73.5
4/12/01 9:47	26.34	75.9
4/12/01 9:49	26.34	75.9
4/12/01 9:51	25.95	75.9
4/12/01 9:53	26.34	75.9
4/12/01 9:55	26.34	74.9
4/12/01 9:57	26.34	74.9
4/12/01 9:59	26.34	74.9
4/12/01 10:01	26.34	74.4
4/12/01 10:03	26.34	77.4
4/12/01 10:05	26.34	73.5
4/12/01 10:07	26.73	74.9
4/12/01 10:09	27.52	74
4/12/01 10:11	27.52	73
4/12/01 10:13	27.91	74
4/12/01 10:15	28.31	72
4/12/01 10:17	28.31	71
4/12/01 10:19	27.91	71
4/12/01 10:21	27.91	70
4/12/01 10:23	27.52	71
4/12/01 10:25	27.12	71.5
4/12/01 10:27	27.52	71.5
4/12/01 10:29	27.91	71.5
4/12/01 10:31	27.91	70
4/12/01 10:33	27.12	71.5

Date And Time	Temperature (° C)	RH (%)
4/12/01 10:35	27.12	72
4/12/01 10:37	26.73	71.5
4/12/01 10:39	26.73	72.5
4/12/01 10:41	26.34	72
4/12/01 10:43	26.73	73.5
4/12/01 10:45	26.73	72.5
4/12/01 10:47	26.73	72.5
4/12/01 10:49	26.73	72.5
4/12/01 10:51	26.73	71.5
4/12/01 10:53	26.34	72.5
4/12/01 10:55	26.34	73
4/12/01 10:57	26.34	73.5
4/12/01 10:59	27.12	74
4/12/01 11:01	27.52	75.4
4/12/01 11:03	27.12	71
4/12/01 11:05	26.73	73
4/12/01 11:07	27.52	75.4
4/12/01 11:09	27.52	74.4
4/12/01 11:11	27.12	71.5
4/12/01 11:13	27.12	74
4/12/01 11:15	27.52	71
4/12/01 11:17	28.31	71
4/12/01 11:19	28.31	72
4/12/01 11:21	27.91	73
4/12/01 11:23	27.91	74.4
4/12/01 11:25	28.31	71
4/12/01 11:27	29.1	72
4/12/01 11:29	29.5	71
4/12/01 11:31	29.5	67.5
4/12/01 11:33	29.5	66.4
4/12/01 11:35	29.1	68
4/12/01 11:37	29.1	60.8
4/12/01 11:39	28.31	61.8
4/12/01 11:41	27.12	63.9
4/12/01 11:43	27.12	62.9
4/12/01 11:45	26.73	63.4
4/12/01 11:47	27.12	58.2
4/12/01 11:49	29.9	42.2
4/12/01 11:51	30.71	51.5
4/12/01 11:53	29.5	54.6
4/12/01 11:55	29.1	62.4
4/12/01 11:57	29.9	54.1
4/12/01 11:59	28.7	56.2
4/12/01 12:01	27.91	45.3
4/12/01 12:03	27.52	37.2
4/12/01 12:05	27.52	36.7
4/12/01 12:07	27.12	38.2
4/12/01 12:09	26.73	37.7
4/12/01 12:11	25.95	37.2
4/12/01 12:13	25.56	37.2

Date And Time	Temperature (° C)	RH (%)
4/12/01 12:15	25.17	37.2
4/12/01 12:17	24.79	37.7
4/12/01 12:19	24.4	38.2
4/12/01 12:21	24.01	38.7
4/12/01 12:23	24.01	39.7
4/12/01 12:25	23.63	40.2
4/12/01 12:27	23.63	44.3
4/12/01 12:29	23.63	42.7
4/12/01 12:31	23.63	42.2
4/12/01 12:33	23.63	42.2
4/12/01 12:35	23.63	42.7
4/12/01 12:37	23.63	44.8
4/12/01 12:39	23.63	43.8
4/12/01 12:41	23.63	42.2
4/12/01 12:43	23.63	41.2
4/12/01 12:45	23.63	41.2
4/12/01 12:47	23.63	41.7
4/12/01 12:49	23.24	41.7
4/12/01 12:51	23.24	41.2
4/12/01 12:53	23.24	41.2
4/12/01 12:55	23.24	42.7
4/12/01 12:57	23.24	44.8
4/12/01 12:59	23.24	43.2
4/12/01 13:01	23.24	42.7
4/12/01 13:03	23.24	42.7
4/12/01 13:05	23.24	42.7
4/12/01 13:07	23.24	43.8
4/12/01 13:09	23.24	43.2
4/12/01 13:11	23.63	42.2
4/12/01 13:13	23.63	42.2
4/12/01 13:15	23.63	41.2
4/12/01 13:17	23.24	40.7
4/12/01 13:19	23.24	40.2
4/12/01 13:21	23.24	40.2
4/12/01 13:23	23.24	40.2
4/12/01 13:25	23.24	41.7
4/12/01 13:27	23.24	43.8
4/12/01 13:29	23.24	42.7
4/12/01 13:31	23.24	42.7
4/12/01 13:33	23.24	42.7
4/12/01 13:35	23.63	42.2
4/12/01 13:37	23.63	43.8
4/12/01 13:39	23.63	43.2
4/12/01 13:41	23.63	42.2
4/12/01 13:43	23.63	41.7
4/12/01 13:45	23.63	41.2
4/12/01 13:47	23.63	41.7
4/12/01 13:49	23.63	41.7
4/12/01 13:51	23.24	41.2
4/12/01 13:53	23.24	41.7

Date And Time	Temperature (° C)	RH (%)
4/12/01 13:55	23.24	41.7
4/12/01 13:57	23.24	42.2
4/12/01 13:59	23.24	47.4
4/12/01 14:01	23.24	46.8
4/12/01 14:03	23.63	44.8
4/12/01 14:05	23.63	43.2
4/12/01 14:07	23.63	43.2
4/12/01 14:09	23.63	45.8
4/12/01 14:11	24.01	45.3
4/12/01 14:13	24.01	43.2
4/12/01 14:15	24.01	42.7
4/12/01 14:17	24.01	42.2
4/12/01 14:19	23.63	42.2
4/12/01 14:21	23.63	42.2
4/12/01 14:23	23.63	41.7
4/12/01 14:25	23.63	41.7
4/12/01 14:27	23.63	41.2
4/12/01 14:29	23.24	40.7
4/12/01 14:31	23.24	40.7
4/12/01 14:33	23.24	40.7
4/12/01 14:35	23.24	41.2
4/12/01 14:37	23.24	46.3
4/12/01 14:39	23.63	46.8
4/12/01 14:41	23.63	46.8
4/12/01 14:43	24.01	46.3
4/12/01 14:45	24.01	44.8
4/12/01 14:47	24.01	44.8
4/12/01 14:49	24.01	44.8
4/12/01 14:51	23.63	44.8
4/12/01 14:53	23.63	44.8
4/12/01 14:55	24.01	44.8
4/12/01 14:57	24.01	45.3
4/12/01 14:59	24.01	45.8
4/12/01 15:01	24.01	46.3
4/12/01 15:03	24.01	46.8
4/12/01 15:05	24.01	46.8
4/12/01 15:07	24.01	47.4
4/12/01 15:09	24.01	47.4
4/12/01 15:11	24.01	47.4
4/12/01 15:13	24.01	47.4
4/12/01 15:15	24.01	47.4
4/12/01 15:17	24.01	47.4
4/12/01 15:19	24.01	47.4
4/12/01 15:21	24.01	47.4
4/12/01 15:23	24.01	47.4
4/12/01 15:25	24.01	47.4
4/12/01 15:27	24.01	47.4
4/12/01 15:29	24.01	47.9
4/12/01 15:31	24.01	48.4
4/12/01 15:33	24.01	48.9

Date And Time	Temperature (° C)	RH (%)
4/12/01 15:35	24.01	48.9
4/12/01 15:37	24.01	49.4
4/12/01 15:39	24.01	49.9
4/12/01 15:41	24.4	50.5
4/12/01 15:43	24.4	51
4/12/01 15:45	24.4	51.5
4/12/01 15:47	24.4	51.5
4/12/01 15:49	24.4	52
4/12/01 15:51	24.79	52
4/12/01 15:53	24.79	52.5
4/12/01 15:55	24.79	53
4/12/01 15:57	24.79	53
4/12/01 15:59	25.17	53.6
4/12/01 16:01	25.17	54.1
4/12/01 16:03	25.17	54.1
4/12/01 16:05	25.17	54.1
4/12/01 16:07	25.56	54.6
4/12/01 16:09	25.56	55.1
4/12/01 16:11	25.56	55.1
4/12/01 16:13	25.56	55.1
4/12/01 16:15	25.95	55.1
4/12/01 16:17	25.95	55.6
4/12/01 16:19	25.95	55.6
4/12/01 16:21	25.95	56.2
4/12/01 16:23	25.95	55.6
4/12/01 16:25	26.34	55.6
4/12/01 16:27	26.34	56.2
4/12/01 16:29	26.34	56.2
4/12/01 16:31	26.34	56.7
4/12/01 16:33	26.73	56.2
4/12/01 16:35	26.73	56.2
4/12/01 16:37	26.73	56.2
4/12/01 16:39	26.73	56.7
4/12/01 16:41	27.12	56.7
4/12/01 16:43	27.12	56.2
4/12/01 16:45	27.12	56.2
4/12/01 16:47	27.12	56.2
4/12/01 16:49	27.12	56.2
4/12/01 16:51	27.52	56.2
4/12/01 16:53	27.52	56.2
4/12/01 16:55	27.52	56.2
4/12/01 16:57	27.52	56.2
4/12/01 16:59	27.52	56.2
4/12/01 17:01	27.91	55.6
4/12/01 17:03	27.91	56.2
4/12/01 17:05	27.91	56.2
4/12/01 17:07	27.91	56.2
4/12/01 17:09	27.91	56.2
4/12/01 17:11	28.31	55.6
4/12/01 17:13	28.31	55.6

Date And Time	Temperature (° C)	RH (%)
4/12/01 17:15	28.31	55.6
4/12/01 17:17	28.31	55.6
4/12/01 17:19	28.31	55.1
4/12/01 17:21	28.31	55.1
4/12/01 17:23	28.31	54.1
4/12/01 17:25	28.31	54.6
4/12/01 17:27	28.31	54.1
4/12/01 17:29	28.31	54.1
4/12/01 17:31	28.31	53.6
4/12/01 17:33	28.31	53.6
4/12/01 17:35	28.31	53.6
4/12/01 17:37	28.31	53
4/12/01 17:39	28.31	53
4/12/01 17:41	28.31	53
4/12/01 17:43	28.31	53
4/12/01 17:45	28.31	52.5
4/12/01 17:47	28.31	52.5
4/12/01 17:49	28.31	52
4/12/01 17:51	28.31	51.5
4/12/01 17:53	28.31	51.5
4/12/01 17:55	28.7	51
4/12/01 17:57	28.7	51
4/12/01 17:59	28.7	50.5
4/12/01 18:01	28.7	50.5
4/12/01 18:03	28.7	49.9
4/12/01 18:05	28.7	49.9
4/12/01 18:07	28.7	49.9
4/12/01 18:09	28.7	49.4
4/12/01 18:11	28.7	49.4
4/12/01 18:13	28.7	49.4
4/12/01 18:15	28.7	49.4
4/12/01 18:17	28.7	49.4
4/12/01 18:19	28.7	48.9
4/12/01 18:21	28.7	48.9
4/12/01 18:23	28.7	48.9
4/12/01 18:25	28.7	48.9
4/12/01 18:27	28.7	48.9
4/12/01 18:29	29.1	48.4
4/12/01 18:31	29.1	48.4
4/12/01 18:33	29.1	48.4
4/12/01 18:35	29.1	48.4
4/12/01 18:37	29.1	47.9
4/12/01 18:39	29.1	47.9
4/12/01 18:41	29.1	47.9
4/12/01 18:43	29.1	47.9
4/12/01 18:45	29.1	47.4
4/12/01 18:47	29.1	47.4
4/12/01 18:49	29.1	47.9
4/12/01 18:51	29.1	47.4
4/12/01 18:53	29.1	47.4

Date And Time	Temperature (° C)	RH (%)
4/12/01 18:55	29.1	47.4
4/12/01 18:57	29.1	47.4
4/12/01 18:59	29.1	47.4
4/12/01 19:01	29.1	47.4
4/12/01 19:03	29.1	46.8
4/12/01 19:05	29.1	47.4
4/12/01 19:07	29.1	46.8
4/12/01 19:09	29.1	46.8
4/12/01 19:11	29.1	46.8
4/12/01 19:13	29.1	46.8
4/12/01 19:15	29.1	46.8
4/12/01 19:17	29.1	46.8
4/12/01 19:19	29.1	46.8
4/12/01 19:21	29.1	46.8
4/12/01 19:23	29.1	46.8
4/12/01 19:25	29.1	46.8
4/12/01 19:27	29.1	46.8
4/12/01 19:29	29.1	46.8
4/12/01 19:31	29.1	46.8
4/12/01 19:33	29.1	46.8
4/12/01 19:35	29.1	46.3
4/12/01 19:37	29.1	45.8
4/12/01 19:39	29.1	45.8
4/12/01 19:41	29.1	45.8
4/12/01 19:43	29.1	46.3
4/12/01 19:45	29.1	46.3
4/12/01 19:47	29.1	46.3
4/12/01 19:49	29.1	46.3
4/12/01 19:51	29.1	46.3
4/12/01 19:53	29.1	46.3
4/12/01 19:55	29.1	46.3
4/12/01 19:57	29.1	46.3
4/12/01 19:59	29.1	46.3
4/12/01 20:01	29.1	46.3
4/12/01 20:03	29.1	46.3
4/12/01 20:05	29.1	46.3
4/12/01 20:07	29.1	46.3
4/12/01 20:09	29.1	46.3
4/12/01 20:11	29.1	46.3
4/12/01 20:13	29.1	46.3
4/12/01 20:15	29.1	46.8
4/12/01 20:17	29.1	46.3
4/12/01 20:19	29.1	46.3
4/12/01 20:21	29.1	46.3
4/12/01 20:23	29.1	46.3
4/12/01 20:25	29.1	46.3
4/12/01 20:27	29.1	46.3
4/12/01 20:29	29.1	45.8
4/12/01 20:31	29.1	46.3
4/12/01 20:33	28.7	46.3

Date And Time	Temperature (° C)	RH (%)
4/12/01 20:35	28.7	45.8
4/12/01 20:37	28.7	45.8
4/12/01 20:39	28.7	45.8
4/12/01 20:41	28.7	45.8
4/12/01 20:43	28.7	45.8
4/12/01 20:45	28.7	45.8
4/12/01 20:47	28.7	45.8
4/12/01 20:49	28.7	45.8
4/12/01 20:51	28.7	45.8
4/12/01 20:53	28.7	45.8
4/12/01 20:55	28.7	45.3
4/12/01 20:57	28.7	45.8
4/12/01 20:59	28.7	45.3
4/12/01 21:01	28.7	45.3
4/12/01 21:03	28.7	45.3
4/12/01 21:05	28.7	45.3
4/12/01 21:07	28.7	45.3
4/12/01 21:09	28.7	45.3
4/12/01 21:11	28.7	45.3
4/12/01 21:13	28.7	45.3
4/12/01 21:15	28.7	45.3
4/12/01 21:17	28.7	44.8
4/12/01 21:19	28.7	45.3
4/12/01 21:21	28.7	44.8
4/12/01 21:23	28.7	44.8
4/12/01 21:25	28.7	44.8
4/12/01 21:27	28.7	44.8
4/12/01 21:29	28.31	44.8
4/12/01 21:31	28.31	44.8
4/12/01 21:33	28.31	44.8
4/12/01 21:35	28.31	45.3
4/12/01 21:37	28.31	45.3
4/12/01 21:39	28.31	45.3
4/12/01 21:41	28.31	44.8
4/12/01 21:43	28.31	44.8
4/12/01 21:45	28.31	44.8
4/12/01 21:47	28.31	44.8
4/12/01 21:49	28.31	44.8
4/12/01 21:51	28.31	44.8
4/12/01 21:53	28.31	44.8
4/12/01 21:55	28.31	44.8
4/12/01 21:57	28.31	44.3
4/12/01 21:59	28.31	44.3
4/12/01 22:01	28.31	44.3
4/12/01 22:03	28.31	44.3
4/12/01 22:05	28.31	44.3
4/12/01 22:07	28.31	44.3
4/12/01 22:09	28.31	44.3
4/12/01 22:11	28.31	44.3
4/12/01 22:13	28.31	44.3

Date And Time	Temperature (° C)	RH (%)
4/12/01 22:15	28.31	44.3
4/12/01 22:17	28.31	44.3
4/12/01 22:19	28.31	43.8
4/12/01 22:21	28.31	43.8
4/12/01 22:23	28.31	43.8
4/12/01 22:25	28.31	43.8
4/12/01 22:27	27.91	43.8
4/12/01 22:29	27.91	43.8
4/12/01 22:31	27.91	43.8
4/12/01 22:33	27.91	43.8
4/12/01 22:35	27.91	43.2
4/12/01 22:37	27.91	43.2
4/12/01 22:39	27.91	43.8
4/12/01 22:41	27.91	43.8
4/12/01 22:43	27.91	43.8
4/12/01 22:45	27.91	43.8
4/12/01 22:47	27.91	43.8
4/12/01 22:49	27.91	43.8
4/12/01 22:51	27.91	43.8
4/12/01 22:53	27.91	43.8
4/12/01 22:55	27.91	43.2
4/12/01 22:57	27.91	43.2
4/12/01 22:59	27.91	43.2
4/12/01 23:01	27.91	43.2
4/12/01 23:03	27.91	43.2
4/12/01 23:05	27.91	43.2
4/12/01 23:07	27.91	43.2
4/12/01 23:09	27.91	43.2
4/12/01 23:11	27.52	43.2
4/12/01 23:13	27.52	42.7
4/12/01 23:15	27.52	42.7
4/12/01 23:17	27.52	42.7
4/12/01 23:19	27.52	42.7
4/12/01 23:21	27.52	42.7
4/12/01 23:23	27.52	42.7
4/12/01 23:25	27.52	42.7
4/12/01 23:27	27.52	42.7
4/12/01 23:29	27.52	43.2
4/12/01 23:31	27.52	43.2
4/12/01 23:33	27.52	43.2
4/12/01 23:35	27.52	42.7
4/12/01 23:37	27.52	42.7
4/12/01 23:39	27.52	42.7
4/12/01 23:41	27.52	42.7
4/12/01 23:43	27.52	42.7
4/12/01 23:45	27.52	42.7
4/12/01 23:47	27.52	42.7
4/12/01 23:49	27.52	42.7
4/12/01 23:51	27.12	42.7
4/12/01 23:53	27.12	42.7

Date And Time	Temperature (° C)	RH (%)
4/12/01 23:55	27.12	42.2
4/12/01 23:57	27.12	42.2
4/12/01 23:59	27.12	42.2
4/13/01 0:01	27.12	42.2
4/13/01 0:03	27.12	42.2
4/13/01 0:05	27.12	42.2
4/13/01 0:07	27.12	42.2
4/13/01 0:09	27.12	42.7
4/13/01 0:11	27.12	42.7
4/13/01 0:13	27.12	42.7
4/13/01 0:15	27.12	42.2
4/13/01 0:17	27.12	42.2
4/13/01 0:19	27.12	42.2
4/13/01 0:21	27.12	42.2
4/13/01 0:23	27.12	42.2
4/13/01 0:25	27.12	42.2
4/13/01 0:27	27.12	42.2
4/13/01 0:29	26.73	42.2
4/13/01 0:31	26.73	42.2
4/13/01 0:33	26.73	41.7
4/13/01 0:35	26.73	42.2
4/13/01 0:37	26.73	41.7
4/13/01 0:39	26.73	41.7
4/13/01 0:41	26.73	41.7
4/13/01 0:43	26.73	41.7
4/13/01 0:45	26.73	41.7
4/13/01 0:47	26.73	41.7
4/13/01 0:49	26.73	42.2
4/13/01 0:51	26.73	42.2
4/13/01 0:53	26.73	42.2
4/13/01 0:55	26.73	41.7
4/13/01 0:57	26.73	41.7
4/13/01 0:59	26.73	41.7
4/13/01 1:01	26.73	41.7
4/13/01 1:03	26.34	41.7
4/13/01 1:05	26.34	41.7
4/13/01 1:07	26.34	41.7
4/13/01 1:09	26.34	41.7
4/13/01 1:11	26.34	41.7
4/13/01 1:13	26.34	41.7
4/13/01 1:15	26.34	41.7
4/13/01 1:17	26.34	41.2
4/13/01 1:19	26.34	41.7
4/13/01 1:21	26.34	41.2
4/13/01 1:23	26.34	41.2
4/13/01 1:25	26.34	41.7
4/13/01 1:27	26.34	41.7
4/13/01 1:29	26.34	41.7
4/13/01 1:31	26.34	41.7
4/13/01 1:33	26.34	41.7

Date And Time	Temperature (° C)	RH (%)
4/13/01 1:35	26.34	41.7
4/13/01 1:37	26.34	41.7
4/13/01 1:39	25.95	41.7
4/13/01 1:41	25.95	41.7
4/13/01 1:43	25.95	41.2
4/13/01 1:45	25.95	41.2
4/13/01 1:47	25.95	41.2
4/13/01 1:49	25.95	41.2
4/13/01 1:51	25.95	41.2
4/13/01 1:53	25.95	41.2
4/13/01 1:55	25.95	41.2
4/13/01 1:57	25.95	41.2
4/13/01 1:59	25.95	41.2
4/13/01 2:01	25.95	41.7
4/13/01 2:03	25.95	41.7
4/13/01 2:05	25.95	41.7
4/13/01 2:07	25.95	41.2
4/13/01 2:09	25.95	41.2
4/13/01 2:11	25.95	41.2
4/13/01 2:13	25.56	41.2
4/13/01 2:15	25.56	41.2
4/13/01 2:17	25.56	41.2
4/13/01 2:19	25.56	41.2
4/13/01 2:21	25.56	41.2
4/13/01 2:23	25.56	41.2
4/13/01 2:25	25.56	41.2
4/13/01 2:27	25.56	41.2
4/13/01 2:29	25.56	41.2
4/13/01 2:31	25.56	41.2
4/13/01 2:33	25.56	41.2
4/13/01 2:35	25.56	40.7
4/13/01 2:37	25.56	41.2
4/13/01 2:39	25.56	41.2
4/13/01 2:41	25.56	41.2
4/13/01 2:43	25.56	41.2
4/13/01 2:45	25.56	41.2
4/13/01 2:47	25.17	41.2
4/13/01 2:49	25.17	41.2
4/13/01 2:51	25.17	41.2
4/13/01 2:53	25.17	41.2
4/13/01 2:55	25.17	41.2
4/13/01 2:57	25.17	41.2
4/13/01 2:59	25.17	41.2
4/13/01 3:01	25.17	41.2
4/13/01 3:03	25.17	41.2
4/13/01 3:05	25.17	41.2
4/13/01 3:07	25.17	41.2
4/13/01 3:09	25.17	41.2
4/13/01 3:11	25.17	41.2
4/13/01 3:13	25.17	41.2

Date And Time	Temperature (° C)	RH (%)
4/13/01 3:15	25.17	41.7
4/13/01 3:17	25.17	41.7
4/13/01 3:19	25.17	41.7
4/13/01 3:21	25.17	41.2
4/13/01 3:23	25.17	41.7
4/13/01 3:25	25.17	41.2
4/13/01 3:27	25.17	41.2
4/13/01 3:29	25.17	41.7
4/13/01 3:31	25.17	41.2
4/13/01 3:33	25.17	41.2
4/13/01 3:35	24.79	41.2
4/13/01 3:37	24.79	41.2
4/13/01 3:39	24.79	41.2
4/13/01 3:41	24.79	41.2
4/13/01 3:43	24.79	41.7
4/13/01 3:45	24.79	41.2
4/13/01 3:47	24.79	41.2
4/13/01 3:49	24.79	41.2
4/13/01 3:51	24.79	41.2
4/13/01 3:53	24.79	41.2
4/13/01 3:55	24.79	41.2
4/13/01 3:57	24.79	41.2
4/13/01 3:59	24.79	41.2
4/13/01 4:01	24.79	41.2
4/13/01 4:03	24.79	41.7
4/13/01 4:05	24.79	41.7
4/13/01 4:07	24.79	41.7
4/13/01 4:09	24.79	41.7
4/13/01 4:11	24.79	41.7
4/13/01 4:13	24.79	41.7
4/13/01 4:15	24.79	41.7
4/13/01 4:17	24.79	41.7
4/13/01 4:19	24.79	41.7
4/13/01 4:21	24.79	41.7
4/13/01 4:23	24.4	41.7
4/13/01 4:25	24.4	41.7
4/13/01 4:27	24.4	41.7
4/13/01 4:29	24.4	41.7
4/13/01 4:31	24.4	41.7
4/13/01 4:33	24.4	41.7
4/13/01 4:35	24.4	41.7
4/13/01 4:37	24.4	41.7
4/13/01 4:39	24.4	41.7
4/13/01 4:41	24.4	41.7
4/13/01 4:43	24.4	41.7
4/13/01 4:45	24.4	41.7
4/13/01 4:47	24.4	41.7
4/13/01 4:49	24.4	41.7
4/13/01 4:51	24.4	41.2
4/13/01 4:53	24.4	41.2

Date And Time	Temperature (° C)	RH (%)
4/13/01 4:55	24.4	41.7
4/13/01 4:57	24.4	41.7
4/13/01 4:59	24.4	41.7
4/13/01 5:01	24.4	41.7
4/13/01 5:03	24.4	41.7
4/13/01 5:05	24.4	41.7
4/13/01 5:07	24.4	41.7
4/13/01 5:09	24.4	41.7
4/13/01 5:11	24.4	41.7
4/13/01 5:13	24.4	41.7
4/13/01 5:15	24.4	41.7
4/13/01 5:17	24.4	41.7
4/13/01 5:19	24.4	41.7
4/13/01 5:21	24.01	41.7
4/13/01 5:23	24.01	41.7
4/13/01 5:25	24.01	41.7
4/13/01 5:27	24.01	41.7
4/13/01 5:29	24.01	41.7
4/13/01 5:31	24.01	41.7
4/13/01 5:33	24.01	41.7
4/13/01 5:35	24.01	41.7
4/13/01 5:37	24.01	41.7
4/13/01 5:39	24.01	41.7
4/13/01 5:41	24.01	41.7
4/13/01 5:43	24.01	41.7
4/13/01 5:45	24.01	41.7
4/13/01 5:47	24.01	41.7
4/13/01 5:49	24.01	41.7
4/13/01 5:51	24.01	41.7
4/13/01 5:53	24.01	41.7
4/13/01 5:55	24.01	42.2
4/13/01 5:57	24.01	42.2
4/13/01 5:59	24.01	42.2
4/13/01 6:01	24.01	42.2
4/13/01 6:03	24.01	42.2
4/13/01 6:05	24.01	42.2
4/13/01 6:07	24.01	42.2
4/13/01 6:09	24.01	42.2
4/13/01 6:11	24.01	42.2
4/13/01 6:13	24.01	42.2
4/13/01 6:15	24.01	42.2
4/13/01 6:17	24.01	42.2
4/13/01 6:19	24.01	42.2
4/13/01 6:21	24.01	42.2
4/13/01 6:23	24.01	42.2
4/13/01 6:25	23.63	41.7
4/13/01 6:27	23.63	42.2
4/13/01 6:29	23.63	42.2
4/13/01 6:31	23.63	41.7
4/13/01 6:33	23.63	42.2

Date And Time	Temperature (° C)	RH (%)
4/13/01 6:35	23.63	41.7
4/13/01 6:37	23.63	42.2
4/13/01 6:39	23.63	41.7
4/13/01 6:41	23.63	41.7
4/13/01 6:43	23.63	41.7
4/13/01 6:45	23.63	41.7
4/13/01 6:47	23.63	41.7
4/13/01 6:49	23.63	41.7
4/13/01 6:51	23.63	41.7
4/13/01 6:53	23.63	41.7
4/13/01 6:55	23.63	41.7
4/13/01 6:57	23.63	41.7
4/13/01 6:59	23.63	41.7
4/13/01 7:01	23.63	42.2
4/13/01 7:03	23.63	42.2
4/13/01 7:05	23.63	42.2
4/13/01 7:07	23.63	42.2
4/13/01 7:09	23.63	42.2
4/13/01 7:11	23.63	42.2
4/13/01 7:13	23.63	42.2
4/13/01 7:15	23.63	42.2
4/13/01 7:17	23.63	42.2
4/13/01 7:19	23.63	42.2
4/13/01 7:21	23.63	42.2
4/13/01 7:23	23.63	42.2
4/13/01 7:25	23.63	42.2
4/13/01 7:27	23.63	42.2
4/13/01 7:29	23.63	42.2
4/13/01 7:31	23.63	42.2
4/13/01 7:33	23.63	42.7
4/13/01 7:35	23.63	42.7
4/13/01 7:37	23.63	42.2
4/13/01 7:39	23.63	42.2
4/13/01 7:41	23.63	42.7
4/13/01 7:43	23.63	42.7
4/13/01 7:45	23.63	42.7
4/13/01 7:47	23.63	42.7
4/13/01 7:49	23.63	42.7
4/13/01 7:51	23.63	42.7
4/13/01 7:53	23.63	42.7
4/13/01 7:55	23.63	42.7
4/13/01 7:57	23.63	42.7
4/13/01 7:59	23.63	43.2
4/13/01 8:01	23.63	42.7
4/13/01 8:03	23.63	42.7
4/13/01 8:05	23.63	42.7
4/13/01 8:07	23.63	42.7
4/13/01 8:09	23.63	42.7
4/13/01 8:11	23.63	42.7
4/13/01 8:13	23.63	42.7

Date And Time	Temperature (° C)	RH (%)
4/13/01 8:15	23.63	42.7
4/13/01 8:17	23.63	42.7
4/13/01 8:19	23.63	42.7
4/13/01 8:21	23.63	42.7
4/13/01 8:23	23.63	42.7
4/13/01 8:25	23.63	43.2
4/13/01 8:27	23.63	43.2
4/13/01 8:29	23.63	43.2
4/13/01 8:31	23.63	43.2
4/13/01 8:33	23.63	43.2
4/13/01 8:35	23.63	43.2
4/13/01 8:37	23.63	43.2
4/13/01 8:39	23.63	43.2
4/13/01 8:41	23.63	43.8
4/13/01 8:43	23.63	43.8
4/13/01 8:45	23.63	43.8
4/13/01 8:47	23.63	43.8
4/13/01 8:49	23.63	43.8
4/13/01 8:51	23.63	43.8
4/13/01 8:53	23.63	44.3
4/13/01 8:55	23.63	44.3
4/13/01 8:57	23.63	44.3
4/13/01 8:59	23.63	44.3
4/13/01 9:01	23.63	44.3
4/13/01 9:03	23.63	44.3
4/13/01 9:05	24.01	44.8
4/13/01 9:07	24.01	44.8
4/13/01 9:09	24.01	44.8
4/13/01 9:11	24.01	44.8
4/13/01 9:13	24.01	44.8
4/13/01 9:15	24.01	44.8
4/13/01 9:17	24.01	45.3
4/13/01 9:19	24.01	44.8
4/13/01 9:21	24.01	44.8
4/13/01 9:23	24.01	45.3
4/13/01 9:25	24.01	45.3
4/13/01 9:27	24.01	45.3
4/13/01 9:29	24.01	45.3
4/13/01 9:31	24.01	45.8
4/13/01 9:33	24.01	45.3
4/13/01 9:35	24.01	45.8
4/13/01 9:37	24.01	45.8
4/13/01 9:39	24.4	45.8
4/13/01 9:41	24.4	45.8
4/13/01 9:43	24.4	45.8
4/13/01 9:45	24.4	46.3
4/13/01 9:47	24.4	46.3
4/13/01 9:49	24.4	46.3
4/13/01 9:51	24.4	46.8
4/13/01 9:53	24.4	46.3

Date And Time	Temperature (° C)	RH (%)
4/13/01 9:55	24.4	46.3
4/13/01 9:57	24.4	45.8
4/13/01 9:59	24.4	46.3
4/13/01 10:01	24.4	45.8
4/13/01 10:03	24.4	45.8
4/13/01 10:05	24.4	45.8
4/13/01 10:07	24.4	45.8
4/13/01 10:09	24.4	45.8
4/13/01 10:11	24.4	45.8
4/13/01 10:13	24.4	45.8
4/13/01 10:15	24.79	45.8
4/13/01 10:17	24.79	45.8
4/13/01 10:19	24.79	45.8
4/13/01 10:21	24.79	45.8
4/13/01 10:23	24.4	45.8
4/13/01 10:25	24.4	45.8
4/13/01 10:27	24.4	45.8
4/13/01 10:29	24.4	45.8
4/13/01 10:31	24.4	45.3
4/13/01 10:33	24.4	45.3
4/13/01 10:35	24.4	45.3
4/13/01 10:37	24.4	45.3
4/13/01 10:39	24.4	45.3
4/13/01 10:41	24.4	45.3
4/13/01 10:43	24.4	45.3
4/13/01 10:45	24.4	45.3
4/13/01 10:47	24.4	45.3
4/13/01 10:49	24.4	45.3
4/13/01 10:51	24.4	45.3
4/13/01 10:53	24.4	45.3
4/13/01 10:55	24.4	45.3
4/13/01 10:57	24.4	45.3
4/13/01 10:59	24.4	44.8
4/13/01 11:01	24.4	44.8
4/13/01 11:03	24.4	44.8
4/13/01 11:05	24.4	44.8
4/13/01 11:07	24.4	44.8
4/13/01 11:09	24.4	44.8
4/13/01 11:11	24.4	44.8
4/13/01 11:13	24.4	44.8
4/13/01 11:15	24.4	44.8
4/13/01 11:17	24.4	44.8
4/13/01 11:19	24.4	44.8
4/13/01 11:21	24.4	44.8
4/13/01 11:23	24.4	44.8
4/13/01 11:25	24.4	44.8
4/13/01 11:27	24.4	44.8
4/13/01 11:29	24.4	44.8
4/13/01 11:31	24.4	44.3
4/13/01 11:33	24.4	44.3

Date And Time	Temperature (° C)	RH (%)
4/13/01 11:35	24.4	44.8
4/13/01 11:37	24.4	44.8
4/13/01 11:39	24.4	44.8
4/13/01 11:41	24.4	44.3
4/13/01 11:43	24.4	44.3
4/13/01 11:45	24.4	44.3
4/13/01 11:47	24.4	44.3
4/13/01 11:49	24.01	44.3
4/13/01 11:51	24.01	44.3
4/13/01 11:53	24.01	44.3
4/13/01 11:55	24.01	44.3
4/13/01 11:57	24.01	44.3
4/13/01 11:59	24.01	44.3
4/13/01 12:01	24.01	44.3
4/13/01 12:03	24.01	44.3
4/13/01 12:05	24.01	44.3
4/13/01 12:07	24.01	44.3
4/13/01 12:09	24.01	44.3
4/13/01 12:11	24.01	44.8
4/13/01 12:13	24.01	44.8
4/13/01 12:15	24.01	44.8
4/13/01 12:17	24.01	44.8
4/13/01 12:19	24.01	44.8
4/13/01 12:21	24.01	44.8
4/13/01 12:23	24.01	44.8
4/13/01 12:25	24.01	44.8
4/13/01 12:27	24.01	44.8
4/13/01 12:29	24.01	44.8
4/13/01 12:31	24.01	44.8
4/13/01 12:33	24.01	44.8
4/13/01 12:35	24.01	44.8
4/13/01 12:37	24.01	44.8
4/13/01 12:39	24.01	44.8
4/13/01 12:41	24.01	44.8
4/13/01 12:43	24.01	44.8
4/13/01 12:45	24.01	44.8
4/13/01 12:47	24.01	45.3
4/13/01 12:49	24.01	45.3
4/13/01 12:51	24.01	45.3
4/13/01 12:53	24.01	45.3
4/13/01 12:55	24.4	45.8
4/13/01 12:57	24.4	45.8
4/13/01 12:59	24.4	45.8
4/13/01 13:01	24.4	46.8
4/13/01 13:03	24.4	47.4
4/13/01 13:05	24.79	47.9
4/13/01 13:07	24.79	48.4
4/13/01 13:09	24.79	48.9
4/13/01 13:11	25.17	49.4
4/13/01 13:13	25.17	48.9

Date And Time	Temperature (° C)	RH (%)
4/13/01 13:15	25.17	49.4
4/13/01 13:17	25.17	49.9
4/13/01 13:19	25.17	49.4
4/13/01 13:21	25.56	49.9
4/13/01 13:23	25.56	50.5
4/13/01 13:25	25.56	51
4/13/01 13:27	25.56	51.5
4/13/01 13:29	25.56	52.5
4/13/01 13:31	25.95	53.6
4/13/01 13:33	25.95	54.1
4/13/01 13:35	25.95	55.1
4/13/01 13:37	26.34	56.2
4/13/01 13:39	26.34	57.2
4/13/01 13:41	26.73	57.2
4/13/01 13:43	26.73	58.2
4/13/01 13:45	26.73	58.7
4/13/01 13:47	27.12	59.8
4/13/01 13:49	27.12	59.8
4/13/01 13:51	27.52	60.3
4/13/01 13:53	27.52	60.8
4/13/01 13:55	27.91	60.8
4/13/01 13:57	27.91	61.3
4/13/01 13:59	27.91	61.8
4/13/01 14:01	28.31	62.4
4/13/01 14:03	28.31	61.8
4/13/01 14:05	28.31	62.4
4/13/01 14:07	28.7	62.4
4/13/01 14:09	28.7	62.4
4/13/01 14:11	29.1	62.9
4/13/01 14:13	29.1	62.4
4/13/01 14:15	29.1	62.4
4/13/01 14:17	29.5	62.9
4/13/01 14:19	29.5	62.4
4/13/01 14:21	29.5	62.4
4/13/01 14:23	29.9	62.9
4/13/01 14:25	29.9	62.9
4/13/01 14:27	29.9	62.4
4/13/01 14:29	29.9	62.4
4/13/01 14:31	30.31	62.4
4/13/01 14:33	30.31	61.8
4/13/01 14:35	30.31	61.8
4/13/01 14:37	30.71	61.8
4/13/01 14:39	30.71	61.8
4/13/01 14:41	30.71	60.8
4/13/01 14:43	30.71	60.8
4/13/01 14:45	30.71	60.8
4/13/01 14:47	31.12	60.8
4/13/01 14:49	31.12	59.3
4/13/01 14:51	31.12	58.7
4/13/01 14:53	31.12	58.2

Date And Time	Temperature (° C)	RH (%)
4/13/01 14:55	31.12	57.7
4/13/01 14:57	31.12	57.2
4/13/01 14:59	31.12	56.7
4/13/01 15:01	31.12	56.2
4/13/01 15:03	31.12	55.6
4/13/01 15:05	31.12	54.6
4/13/01 15:07	31.12	54.6
4/13/01 15:09	30.71	54.1
4/13/01 15:11	30.71	53.6
4/13/01 15:13	30.71	53
4/13/01 15:15	30.71	52.5
4/13/01 15:17	30.71	52.5
4/13/01 15:19	30.71	52
4/13/01 15:21	30.71	51.5
4/13/01 15:23	30.71	51
4/13/01 15:25	30.71	51
4/13/01 15:27	30.71	50.5
4/13/01 15:29	30.71	50.5
4/13/01 15:31	30.71	49.9
4/13/01 15:33	30.71	49.9
4/13/01 15:35	30.71	49.4
4/13/01 15:37	30.71	49.4
4/13/01 15:39	30.71	49.4
4/13/01 15:41	30.31	48.9
4/13/01 15:43	30.31	48.9
4/13/01 15:45	30.31	48.9
4/13/01 15:47	30.31	48.4
4/13/01 15:49	30.31	48.4
4/13/01 15:51	30.31	48.4
4/13/01 15:53	30.31	48.4
4/13/01 15:55	30.31	48.4
4/13/01 15:57	30.31	48.4
4/13/01 15:59	30.31	47.9
4/13/01 16:01	30.31	47.9
4/13/01 16:03	30.31	47.9
4/13/01 16:05	30.31	47.9
4/13/01 16:07	30.31	47.9
4/13/01 16:09	30.31	47.9
4/13/01 16:11	30.31	47.9
4/13/01 16:13	30.31	47.9
4/13/01 16:15	30.31	47.9
4/13/01 16:17	30.31	47.9
4/13/01 16:19	30.31	47.9
4/13/01 16:21	30.31	47.9
4/13/01 16:23	30.31	47.9
4/13/01 16:25	30.31	47.9
4/13/01 16:27	30.31	47.9
4/13/01 16:29	30.31	47.9
4/13/01 16:31	30.31	47.4
4/13/01 16:33	30.31	47.9

Date And Time	Temperature (° C)	RH (%)
4/13/01 16:35	30.31	47.9
4/13/01 16:37	30.31	47.9
4/13/01 16:39	30.31	47.9
4/13/01 16:41	30.31	47.9
4/13/01 16:43	30.31	47.9
4/13/01 16:45	30.31	47.9
4/13/01 16:47	30.31	47.9
4/13/01 16:49	30.31	47.9
4/13/01 16:51	30.31	47.9
4/13/01 16:53	29.9	47.9
4/13/01 16:55	29.9	47.9
4/13/01 16:57	29.9	47.9
4/13/01 16:59	29.9	47.9
4/13/01 17:01	29.9	47.9
4/13/01 17:03	29.9	47.4
4/13/01 17:05	29.9	47.4
4/13/01 17:07	29.9	47.4
4/13/01 17:09	29.9	47.4
4/13/01 17:11	29.9	47.9
4/13/01 17:13	29.9	47.9
4/13/01 17:15	29.9	47.4
4/13/01 17:17	29.5	47.4
4/13/01 17:19	29.5	47.4
4/13/01 17:21	29.5	47.4
4/13/01 17:23	29.5	47.4
4/13/01 17:25	29.5	47.4
4/13/01 17:27	29.5	46.8
4/13/01 17:29	29.5	46.8
4/13/01 17:31	29.5	46.8
4/13/01 17:33	29.1	46.8
4/13/01 17:35	29.1	46.8
4/13/01 17:37	29.1	47.4
4/13/01 17:39	29.1	46.8
4/13/01 17:41	29.1	46.8
4/13/01 17:43	29.1	46.8
4/13/01 17:45	29.1	46.8
4/13/01 17:47	29.1	46.8
4/13/01 17:49	28.7	46.3
4/13/01 17:51	28.7	46.3
4/13/01 17:53	28.7	46.3
4/13/01 17:55	28.7	46.3
4/13/01 17:57	28.7	46.8
4/13/01 17:59	28.7	46.8
4/13/01 18:01	28.7	46.8
4/13/01 18:03	28.7	46.8
4/13/01 18:05	28.7	46.3
4/13/01 18:07	28.31	46.3
4/13/01 18:09	28.31	46.3
4/13/01 18:11	28.31	46.3
4/13/01 18:13	28.31	45.8

Date And Time	Temperature (° C)	RH (%)
4/13/01 18:15	28.31	45.8
4/13/01 18:17	28.31	45.8
4/13/01 18:19	28.31	45.8
4/13/01 18:21	28.31	45.8
4/13/01 18:23	27.91	45.8
4/13/01 18:25	27.91	45.8
4/13/01 18:27	27.91	45.8
4/13/01 18:29	27.91	45.8
4/13/01 18:31	27.91	45.3
4/13/01 18:33	27.91	45.8
4/13/01 18:35	27.91	45.8
4/13/01 18:37	27.52	45.8
4/13/01 18:39	27.52	45.8
4/13/01 18:41	27.52	45.8
4/13/01 18:43	27.52	45.3
4/13/01 18:45	27.52	45.3
4/13/01 18:47	27.52	45.3
4/13/01 18:49	27.52	45.3
4/13/01 18:51	27.52	45.8
4/13/01 18:53	27.12	45.3
4/13/01 18:55	27.12	45.3
4/13/01 18:57	27.12	45.3
4/13/01 18:59	27.12	45.3
4/13/01 19:01	27.12	45.3
4/13/01 19:03	27.12	44.8
4/13/01 19:05	27.12	44.8
4/13/01 19:07	26.73	45.3
4/13/01 19:09	26.73	45.3
4/13/01 19:11	26.73	45.3
4/13/01 19:13	26.73	44.8
4/13/01 19:15	26.73	44.8
4/13/01 19:17	26.73	44.8
4/13/01 19:19	26.34	44.3
4/13/01 19:21	26.34	44.8
4/13/01 19:23	26.34	44.8
4/13/01 19:25	26.34	44.8
4/13/01 19:27	26.34	44.3
4/13/01 19:29	26.34	44.3
4/13/01 19:31	26.34	44.3
4/13/01 19:33	25.95	44.3
4/13/01 19:35	25.95	43.8
4/13/01 19:37	25.95	44.3
4/13/01 19:39	25.95	44.3
4/13/01 19:41	25.95	44.3
4/13/01 19:43	25.95	43.8
4/13/01 19:45	25.56	43.8
4/13/01 19:47	25.56	43.8
4/13/01 19:49	25.56	43.8
4/13/01 19:51	25.56	43.8
4/13/01 19:53	25.56	43.8

Date And Time	Temperature (° C)	RH (%)
4/13/01 19:55	25.56	43.8
4/13/01 19:57	25.17	43.2
4/13/01 19:59	25.17	43.2
4/13/01 20:01	25.17	43.2
4/13/01 20:03	25.17	43.2
4/13/01 20:05	25.17	43.2
4/13/01 20:07	25.17	43.2
4/13/01 20:09	25.17	43.2
4/13/01 20:11	24.79	43.2
4/13/01 20:13	24.79	42.7
4/13/01 20:15	24.79	42.7
4/13/01 20:17	24.79	42.7
4/13/01 20:19	24.79	43.2
4/13/01 20:21	24.79	43.2
4/13/01 20:23	24.79	43.2
4/13/01 20:25	24.4	43.2
4/13/01 20:27	24.4	42.7
4/13/01 20:29	24.4	42.7
4/13/01 20:31	24.4	42.7
4/13/01 20:33	24.4	42.7
4/13/01 20:35	24.4	42.7
4/13/01 20:37	24.4	42.7
4/13/01 20:39	24.4	42.7
4/13/01 20:41	24.01	42.7
4/13/01 20:43	24.01	42.7
4/13/01 20:45	24.01	42.2
4/13/01 20:47	24.01	42.2
4/13/01 20:49	24.01	42.2
4/13/01 20:51	24.01	42.7
4/13/01 20:53	24.01	42.2
4/13/01 20:55	23.63	42.2
4/13/01 20:57	23.63	42.2
4/13/01 20:59	23.63	42.2
4/13/01 21:01	23.63	42.2
4/13/01 21:03	23.63	41.7
4/13/01 21:05	23.63	41.7
4/13/01 21:07	23.63	42.2
4/13/01 21:09	23.63	41.7
4/13/01 21:11	23.24	41.7
4/13/01 21:13	23.24	41.7
4/13/01 21:15	23.24	41.7
4/13/01 21:17	23.24	41.2
4/13/01 21:19	23.24	41.2
4/13/01 21:21	23.24	41.2
4/13/01 21:23	23.24	41.7
4/13/01 21:25	22.86	41.7
4/13/01 21:27	22.86	41.2
4/13/01 21:29	22.86	41.2
4/13/01 21:31	22.86	41.2
4/13/01 21:33	22.86	41.2

Date And Time	Temperature (° C)	RH (%)
4/13/01 21:35	22.86	40.7
4/13/01 21:37	22.86	40.7
4/13/01 21:39	22.86	41.2
4/13/01 21:41	22.48	41.2
4/13/01 21:43	22.48	40.7
4/13/01 21:45	22.48	40.7
4/13/01 21:47	22.48	40.7
4/13/01 21:49	22.48	40.7
4/13/01 21:51	22.48	40.7
4/13/01 21:53	22.48	40.2
4/13/01 21:55	22.09	40.7
4/13/01 21:57	22.09	40.7
4/13/01 21:59	22.09	40.7
4/13/01 22:01	22.09	40.2
4/13/01 22:03	22.09	40.2
4/13/01 22:05	22.09	40.2
4/13/01 22:07	22.09	40.2
4/13/01 22:09	21.71	40.2
4/13/01 22:11	21.71	40.2
4/13/01 22:13	21.71	40.2
4/13/01 22:15	21.71	40.2
4/13/01 22:17	21.71	40.2
4/13/01 22:19	21.71	39.7
4/13/01 22:21	21.71	39.7
4/13/01 22:23	21.33	39.7
4/13/01 22:25	21.33	40.2
4/13/01 22:27	21.33	40.2
4/13/01 22:29	21.33	40.2
4/13/01 22:31	21.33	39.7
4/13/01 22:33	21.33	39.7
4/13/01 22:35	21.33	39.7
4/13/01 22:37	21.33	39.7
4/13/01 22:39	20.95	39.2
4/13/01 22:41	20.95	39.7
4/13/01 22:43	20.95	39.7
4/13/01 22:45	20.95	39.7
4/13/01 22:47	20.95	39.7
4/13/01 22:49	20.95	39.7
4/13/01 22:51	20.95	39.2
4/13/01 22:53	20.95	39.2
4/13/01 22:55	20.57	39.2
4/13/01 22:57	20.57	39.7
4/13/01 22:59	20.57	39.7
4/13/01 23:01	20.57	39.7
4/13/01 23:03	20.57	39.2
4/13/01 23:05	20.57	39.2
4/13/01 23:07	20.57	39.2
4/13/01 23:09	20.57	39.2
4/13/01 23:11	20.57	39.2
4/13/01 23:13	20.19	39.2

Date And Time	Temperature (º C)	RH (%)
4/13/01 23:15	20.19	39.2
4/13/01 23:17	20.19	39.2
4/13/01 23:19	20.19	39.2
4/13/01 23:21	20.19	39.2
4/13/01 23:23	20.19	39.2
4/13/01 23:25	20.19	39.2
4/13/01 23:27	20.19	38.7
4/13/01 23:29	19.81	38.7
4/13/01 23:31	19.81	38.7
4/13/01 23:33	19.81	39.2
4/13/01 23:35	19.81	39.2
4/13/01 23:37	19.81	38.7
4/13/01 23:39	19.81	38.7
4/13/01 23:41	19.81	38.7
4/13/01 23:43	19.81	38.7
4/13/01 23:45	19.42	38.2
4/13/01 23:47	19.42	38.2
4/13/01 23:49	19.42	38.7
4/13/01 23:51	19.42	38.7
4/13/01 23:53	19.42	38.7
4/13/01 23:55	19.42	38.7
4/13/01 23:57	19.42	38.2
4/13/01 23:59	19.42	38.7
4/14/01 0:01	19.04	38.2
4/14/01 0:03	19.04	38.2
4/14/01 0:05	19.04	38.2
4/14/01 0:07	19.04	38.7
4/14/01 0:09	19.04	38.2
4/14/01 0:11	19.04	38.2
4/14/01 0:13	19.04	38.2
4/14/01 0:15	19.04	38.2
4/14/01 0:17	18.66	38.2
4/14/01 0:19	18.66	38.2
4/14/01 0:21	18.66	38.2
4/14/01 0:23	18.66	38.2
4/14/01 0:25	18.66	38.2
4/14/01 0:27	18.66	38.2
4/14/01 0:29	18.66	38.2
4/14/01 0:31	18.66	38.2
4/14/01 0:33	18.66	38.2
4/14/01 0:35	18.28	37.7
4/14/01 0:37	18.28	37.7
4/14/01 0:39	18.28	37.7
4/14/01 0:41	18.28	38.2
4/14/01 0:43	18.28	38.2
4/14/01 0:45	18.28	38.2
4/14/01 0:47	18.28	38.2
4/14/01 0:49	18.28	38.2
4/14/01 0:51	18.28	37.7
4/14/01 0:53	17.9	37.7

Date And Time	Temperature (° C)	RH (%)
4/14/01 0:55	17.9	37.7
4/14/01 0:57	17.9	37.7
4/14/01 0:59	17.9	37.7
4/14/01 1:01	17.9	38.2
4/14/01 1:03	17.9	37.7
4/14/01 1:05	17.9	37.7
4/14/01 1:07	17.9	37.7
4/14/01 1:09	17.9	37.7
4/14/01 1:11	17.52	37.7
4/14/01 1:13	17.52	37.2
4/14/01 1:15	17.52	37.2
4/14/01 1:17	17.52	37.2
4/14/01 1:19	17.52	37.7
4/14/01 1:21	17.52	37.7
4/14/01 1:23	17.52	37.7
4/14/01 1:25	17.52	37.7
4/14/01 1:27	17.52	37.2
4/14/01 1:29	17.14	37.2
4/14/01 1:31	17.14	37.2
4/14/01 1:33	17.14	37.2
4/14/01 1:35	17.14	37.2
4/14/01 1:37	17.14	37.7
4/14/01 1:39	17.14	37.2
4/14/01 1:41	17.14	37.2
4/14/01 1:43	17.14	37.2
4/14/01 1:45	17.14	37.2
4/14/01 1:47	16.76	37.2
4/14/01 1:49	16.76	37.2
4/14/01 1:51	16.76	37.2
4/14/01 1:53	16.76	37.2
4/14/01 1:55	16.76	36.7
4/14/01 1:57	16.76	37.2
4/14/01 1:59	16.76	37.2
4/14/01 2:01	16.76	37.2
4/14/01 2:03	16.76	37.2
4/14/01 2:05	16.38	37.2
4/14/01 2:07	16.38	37.2
4/14/01 2:09	16.38	36.7
4/14/01 2:11	16.38	36.7
4/14/01 2:13	16.38	36.7
4/14/01 2:15	16.38	37.2
4/14/01 2:17	16.38	37.2
4/14/01 2:19	16.38	37.2
4/14/01 2:21	16.38	37.2
4/14/01 2:23	16	36.7
4/14/01 2:25	16	36.7
4/14/01 2:27	16	36.7
4/14/01 2:29	16	36.7
4/14/01 2:31	16	36.7
4/14/01 2:33	16	36.7

Date And Time	Temperature (° C)	RH (%)
4/14/01 2:35	16	37.2
4/14/01 2:37	16	36.7
4/14/01 2:39	16	36.7
4/14/01 2:41	16	36.7
4/14/01 2:43	16	36.7
4/14/01 2:45	15.62	36.7
4/14/01 2:47	15.62	36.7
4/14/01 2:49	15.62	36.2
4/14/01 2:51	15.62	36.7
4/14/01 2:53	15.62	36.7
4/14/01 2:55	15.62	37.2
4/14/01 2:57	15.62	36.7
4/14/01 2:59	15.62	36.7
4/14/01 3:01	15.62	36.7
4/14/01 3:03	15.62	36.7
4/14/01 3:05	15.62	36.7
4/14/01 3:07	15.23	36.7
4/14/01 3:09	15.23	36.7
4/14/01 3:11	15.23	36.7
4/14/01 3:13	15.23	36.7
4/14/01 3:15	15.23	36.7
4/14/01 3:17	15.23	36.2
4/14/01 3:19	15.23	36.2
4/14/01 3:21	15.23	36.2
4/14/01 3:23	15.23	36.7
4/14/01 3:25	15.23	36.7
4/14/01 3:27	15.23	36.7
4/14/01 3:29	15.23	36.7
4/14/01 3:31	15.23	36.7
4/14/01 3:33	15.23	36.7
4/14/01 3:35	15.23	36.7
4/14/01 3:37	15.23	36.7
4/14/01 3:39	15.23	36.2
4/14/01 3:41	15.23	36.2
4/14/01 3:43	15.23	36.2
4/14/01 3:45	14.85	36.2
4/14/01 3:47	14.85	36.2
4/14/01 3:49	14.85	36.2
4/14/01 3:51	14.85	36.2
4/14/01 3:53	14.85	36.2
4/14/01 3:55	14.85	36.7
4/14/01 3:57	14.85	36.2
4/14/01 3:59	14.85	36.7
4/14/01 4:01	14.85	36.2
4/14/01 4:03	14.85	36.2
4/14/01 4:05	14.85	36.2
4/14/01 4:07	14.85	36.2
4/14/01 4:09	14.85	36.2
4/14/01 4:11	14.85	36.2
4/14/01 4:13	14.85	36.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 4:15	14.85	35.7
4/14/01 4:17	14.47	36.2
4/14/01 4:19	14.47	35.7
4/14/01 4:21	14.47	35.7
4/14/01 4:23	14.47	35.7
4/14/01 4:25	14.47	35.7
4/14/01 4:27	14.47	36.2
4/14/01 4:29	14.47	36.2
4/14/01 4:31	14.47	36.2
4/14/01 4:33	14.47	36.2
4/14/01 4:35	14.47	36.2
4/14/01 4:37	14.47	36.2
4/14/01 4:39	14.47	36.2
4/14/01 4:41	14.47	35.7
4/14/01 4:43	14.47	35.7
4/14/01 4:45	14.47	35.7
4/14/01 4:47	14.09	35.7
4/14/01 4:49	14.09	35.7
4/14/01 4:51	14.09	35.7
4/14/01 4:53	14.09	35.7
4/14/01 4:55	14.09	35.7
4/14/01 4:57	14.09	35.7
4/14/01 4:59	14.09	35.2
4/14/01 5:01	14.09	35.7
4/14/01 5:03	14.09	35.7
4/14/01 5:05	14.09	35.7
4/14/01 5:07	14.09	35.7
4/14/01 5:09	14.09	35.7
4/14/01 5:11	13.7	35.7
4/14/01 5:13	13.7	35.7
4/14/01 5:15	13.7	35.7
4/14/01 5:17	13.7	35.7
4/14/01 5:19	13.7	35.7
4/14/01 5:21	13.7	35.2
4/14/01 5:23	13.7	35.2
4/14/01 5:25	13.7	35.2
4/14/01 5:27	13.7	35.2
4/14/01 5:29	13.7	35.7
4/14/01 5:31	13.7	35.7
4/14/01 5:33	13.7	35.7
4/14/01 5:35	13.7	35.7
4/14/01 5:37	13.32	35.7
4/14/01 5:39	13.32	35.7
4/14/01 5:41	13.32	35.7
4/14/01 5:43	13.32	35.2
4/14/01 5:45	13.32	35.2
4/14/01 5:47	13.32	35.2
4/14/01 5:49	13.32	35.2
4/14/01 5:51	13.32	35.2
4/14/01 5:53	13.32	35.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 5:55	13.32	35.7
4/14/01 5:57	13.32	35.7
4/14/01 5:59	13.32	35.7
4/14/01 6:01	13.32	35.2
4/14/01 6:03	12.93	35.7
4/14/01 6:05	12.93	35.7
4/14/01 6:07	12.93	35.2
4/14/01 6:09	12.93	35.2
4/14/01 6:11	12.93	35.2
4/14/01 6:13	12.93	35.2
4/14/01 6:15	12.93	35.2
4/14/01 6:17	12.93	35.2
4/14/01 6:19	12.93	35.2
4/14/01 6:21	12.93	35.2
4/14/01 6:23	12.93	35.7
4/14/01 6:25	12.93	35.7
4/14/01 6:27	12.93	35.7
4/14/01 6:29	12.93	35.7
4/14/01 6:31	12.93	35.7
4/14/01 6:33	12.55	35.7
4/14/01 6:35	12.55	35.7
4/14/01 6:37	12.55	35.2
4/14/01 6:39	12.55	35.2
4/14/01 6:41	12.55	35.2
4/14/01 6:43	12.55	35.2
4/14/01 6:45	12.55	35.2
4/14/01 6:47	12.55	35.2
4/14/01 6:49	12.55	35.2
4/14/01 6:51	12.55	35.2
4/14/01 6:53	12.55	35.2
4/14/01 6:55	12.55	35.7
4/14/01 6:57	12.55	35.7
4/14/01 6:59	12.55	35.7
4/14/01 7:01	12.55	35.7
4/14/01 7:03	12.55	35.7
4/14/01 7:05	12.55	35.7
4/14/01 7:07	12.55	35.7
4/14/01 7:09	12.55	35.7
4/14/01 7:11	12.55	35.7
4/14/01 7:13	12.16	35.7
4/14/01 7:15	12.16	35.7
4/14/01 7:17	12.16	35.7
4/14/01 7:19	12.16	35.7
4/14/01 7:21	12.16	35.7
4/14/01 7:23	12.16	35.7
4/14/01 7:25	12.16	35.7
4/14/01 7:27	12.16	35.7
4/14/01 7:29	12.16	35.7
4/14/01 7:31	12.16	35.7
4/14/01 7:33	12.16	35.7

Date And Time	Temperature (° C)	RH (%)
4/14/01 7:35	12.16	35.7
4/14/01 7:37	12.16	35.7
4/14/01 7:39	12.16	35.7
4/14/01 7:41	12.16	35.7
4/14/01 7:43	12.16	35.7
4/14/01 7:45	12.16	35.7
4/14/01 7:47	12.16	35.7
4/14/01 7:49	12.16	35.7
4/14/01 7:51	12.16	35.7
4/14/01 7:53	12.16	35.7
4/14/01 7:55	12.16	36.2
4/14/01 7:57	12.16	36.2
4/14/01 7:59	12.16	36.2
4/14/01 8:01	12.16	36.2
4/14/01 8:03	12.16	36.2
4/14/01 8:05	12.16	36.2
4/14/01 8:07	12.16	36.2
4/14/01 8:09	12.16	36.2
4/14/01 8:11	12.16	36.2
4/14/01 8:13	12.16	36.2
4/14/01 8:15	12.16	36.7
4/14/01 8:17	12.16	36.7
4/14/01 8:19	12.16	36.7
4/14/01 8:21	12.55	36.7
4/14/01 8:23	12.55	36.7
4/14/01 8:25	12.55	36.7
4/14/01 8:27	12.55	36.7
4/14/01 8:29	12.55	36.7
4/14/01 8:31	12.55	36.7
4/14/01 8:33	12.55	36.7
4/14/01 8:35	12.55	36.7
4/14/01 8:37	12.55	36.7
4/14/01 8:39	12.55	36.7
4/14/01 8:41	12.55	36.7
4/14/01 8:43	12.55	36.7
4/14/01 8:45	12.55	37.2
4/14/01 8:47	12.55	37.2
4/14/01 8:49	12.55	37.2
4/14/01 8:51	12.55	37.2
4/14/01 8:53	12.55	37.2
4/14/01 8:55	12.93	37.7
4/14/01 8:57	12.93	37.7
4/14/01 8:59	12.93	37.7
4/14/01 9:01	12.93	37.7
4/14/01 9:03	12.93	37.7
4/14/01 9:05	12.93	38.2
4/14/01 9:07	12.93	38.2
4/14/01 9:09	12.93	38.2
4/14/01 9:11	12.93	38.7
4/14/01 9:13	12.93	38.7

Date And Time	Temperature (° C)	RH (%)
4/14/01 9:15	12.93	38.7
4/14/01 9:17	13.32	39.2
4/14/01 9:19	13.32	38.7
4/14/01 9:21	13.32	39.2
4/14/01 9:23	13.32	39.2
4/14/01 9:25	13.32	39.2
4/14/01 9:27	13.32	39.7
4/14/01 9:29	13.32	39.7
4/14/01 9:31	13.32	40.2
4/14/01 9:33	13.7	40.2
4/14/01 9:35	13.7	40.2
4/14/01 9:37	13.7	40.7
4/14/01 9:39	13.7	41.2
4/14/01 9:41	13.7	41.2
4/14/01 9:43	13.7	40.7
4/14/01 9:45	14.09	44.8
4/14/01 9:47	14.09	45.3
4/14/01 9:49	14.09	44.8
4/14/01 9:51	14.09	44.8
4/14/01 9:53	14.47	44.3
4/14/01 9:55	14.47	44.3
4/14/01 9:57	14.47	44.3
4/14/01 9:59	14.47	44.3
4/14/01 10:01	14.47	44.8
4/14/01 10:03	14.47	44.3
4/14/01 10:05	14.85	44.3
4/14/01 10:07	14.85	44.3
4/14/01 10:09	14.85	44.3
4/14/01 10:11	14.85	44.3
4/14/01 10:13	14.85	44.3
4/14/01 10:15	14.85	44.3
4/14/01 10:17	14.85	44.3
4/14/01 10:19	15.23	43.8
4/14/01 10:21	15.23	43.8
4/14/01 10:23	15.23	43.8
4/14/01 10:25	15.23	43.8
4/14/01 10:27	15.23	43.8
4/14/01 10:29	15.23	43.8
4/14/01 10:31	15.23	43.8
4/14/01 10:33	15.23	43.8
4/14/01 10:35	15.23	43.2
4/14/01 10:37	15.23	43.2
4/14/01 10:39	15.62	43.8
4/14/01 10:41	15.62	43.2
4/14/01 10:43	15.62	43.2
4/14/01 10:45	15.62	43.2
4/14/01 10:47	15.62	43.8
4/14/01 10:49	15.62	43.2
4/14/01 10:51	15.62	43.2
4/14/01 10:53	15.62	43.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 10:55	15.62	43.8
4/14/01 10:57	15.62	43.2
4/14/01 10:59	15.62	42.7
4/14/01 11:01	15.62	42.7
4/14/01 11:03	16	42.7
4/14/01 11:05	16	42.7
4/14/01 11:07	16	42.7
4/14/01 11:09	16	42.7
4/14/01 11:11	16	42.7
4/14/01 11:13	16	42.7
4/14/01 11:15	16	42.7
4/14/01 11:17	16	42.7
4/14/01 11:19	16	42.7
4/14/01 11:21	16	42.7
4/14/01 11:23	16	42.7
4/14/01 11:25	16	42.7
4/14/01 11:27	16	42.2
4/14/01 11:29	16	42.2
4/14/01 11:31	16	42.2
4/14/01 11:33	16	42.2
4/14/01 11:35	16	42.2
4/14/01 11:37	16	42.2
4/14/01 11:39	16.38	42.2
4/14/01 11:41	16.38	42.2
4/14/01 11:43	16.38	42.2
4/14/01 11:45	16.38	42.2
4/14/01 11:47	16.38	42.2
4/14/01 11:49	16.38	42.2
4/14/01 11:51	16.38	42.2
4/14/01 11:53	16.38	42.2
4/14/01 11:55	16.38	42.2
4/14/01 11:57	16.38	42.2
4/14/01 11:59	16.38	42.2
4/14/01 12:01	16.38	42.2
4/14/01 12:03	16.38	42.7
4/14/01 12:05	16.38	42.2
4/14/01 12:07	16.38	42.2
4/14/01 12:09	16.38	42.2
4/14/01 12:11	16.38	42.2
4/14/01 12:13	16.38	42.2
4/14/01 12:15	16.38	42.2
4/14/01 12:17	16.38	42.2
4/14/01 12:19	16.38	42.2
4/14/01 12:21	16.38	42.2
4/14/01 12:23	16.76	42.2
4/14/01 12:25	16.76	42.2
4/14/01 12:27	16.76	42.2
4/14/01 12:29	16.76	42.2
4/14/01 12:31	16.76	42.2
4/14/01 12:33	16.76	42.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 12:35	16.76	42.2
4/14/01 12:37	16.76	42.2
4/14/01 12:39	16.76	42.2
4/14/01 12:41	16.76	42.2
4/14/01 12:43	16.76	42.2
4/14/01 12:45	16.76	42.2
4/14/01 12:47	16.76	42.2
4/14/01 12:49	16.76	42.2
4/14/01 12:51	16.76	41.7
4/14/01 12:53	16.76	42.2
4/14/01 12:55	16.76	42.2
4/14/01 12:57	16.76	42.2
4/14/01 12:59	16.76	42.2
4/14/01 13:01	16.76	42.2
4/14/01 13:03	16.76	42.2
4/14/01 13:05	16.76	42.2
4/14/01 13:07	17.14	42.2
4/14/01 13:09	17.14	42.2
4/14/01 13:11	17.14	42.2
4/14/01 13:13	17.14	42.2
4/14/01 13:15	17.14	42.2
4/14/01 13:17	17.14	42.2
4/14/01 13:19	17.14	42.2
4/14/01 13:21	17.14	42.2
4/14/01 13:23	17.14	42.2
4/14/01 13:25	17.14	42.7
4/14/01 13:27	17.14	43.8
4/14/01 13:29	17.52	45.8
4/14/01 13:31	17.9	48.9
4/14/01 13:33	18.28	52
4/14/01 13:35	18.66	54.1
4/14/01 13:37	19.04	55.6
4/14/01 13:39	19.42	57.2
4/14/01 13:41	19.81	59.3
4/14/01 13:43	20.19	60.3
4/14/01 13:45	20.95	60.8
4/14/01 13:47	21.33	57.2
4/14/01 13:49	22.09	55.1
4/14/01 13:51	22.09	52.5
4/14/01 13:53	22.48	49.9
4/14/01 13:55	22.86	48.4
4/14/01 13:57	22.86	47.4
4/14/01 13:59	23.24	46.8
4/14/01 14:01	23.24	45.8
4/14/01 14:03	23.63	45.8
4/14/01 14:05	23.63	46.3
4/14/01 14:07	24.01	46.3
4/14/01 14:09	24.01	45.3
4/14/01 14:11	24.4	44.3
4/14/01 14:13	24.4	43.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 14:15	24.4	41.7
4/14/01 14:17	24.4	40.7
4/14/01 14:19	24.79	39.7
4/14/01 14:21	24.79	38.7
4/14/01 14:23	24.79	38.2
4/14/01 14:25	24.79	37.7
4/14/01 14:27	24.4	37.2
4/14/01 14:29	24.4	36.7
4/14/01 14:31	24.4	36.2
4/14/01 14:33	24.4	35.7
4/14/01 14:35	24.4	35.7
4/14/01 14:37	24.4	35.7
4/14/01 14:39	24.4	35.7
4/14/01 14:41	24.4	35.7
4/14/01 14:43	24.4	35.2
4/14/01 14:45	24.4	35.2
4/14/01 14:47	24.01	35.2
4/14/01 14:49	24.01	35.2
4/14/01 14:51	24.01	34.7
4/14/01 14:53	24.01	34.7
4/14/01 14:55	23.63	34.7
4/14/01 14:57	23.63	34.2
4/14/01 14:59	23.63	34.2
4/14/01 15:01	23.63	34.7
4/14/01 15:03	23.63	34.7
4/14/01 15:05	23.24	34.7
4/14/01 15:07	23.24	34.7
4/14/01 15:09	23.24	34.2
4/14/01 15:11	23.24	34.2
4/14/01 15:13	23.24	34.2
4/14/01 15:15	22.86	34.2
4/14/01 15:17	22.86	34.2
4/14/01 15:19	22.86	34.7
4/14/01 15:21	22.86	34.2
4/14/01 15:23	22.86	34.7
4/14/01 15:25	22.86	34.7
4/14/01 15:27	22.86	34.7
4/14/01 15:29	22.86	34.7
4/14/01 15:31	22.86	34.7
4/14/01 15:33	22.48	34.7
4/14/01 15:35	22.48	34.7
4/14/01 15:37	22.48	34.7
4/14/01 15:39	22.48	34.7
4/14/01 15:41	22.48	34.7
4/14/01 15:43	22.48	34.7
4/14/01 15:45	22.48	34.7
4/14/01 15:47	22.48	35.2
4/14/01 15:49	22.48	35.2
4/14/01 15:51	22.48	35.2
4/14/01 15:53	22.48	35.7

Date And Time	Temperature (° C)	RH (%)
4/14/01 15:55	22.48	35.7
4/14/01 15:57	22.48	35.7
4/14/01 15:59	22.48	35.7
4/14/01 16:01	22.09	35.7
4/14/01 16:03	22.09	35.7
4/14/01 16:05	22.09	35.7
4/14/01 16:07	22.09	35.7
4/14/01 16:09	22.09	35.7
4/14/01 16:11	22.09	35.7
4/14/01 16:13	22.09	35.7
4/14/01 16:15	22.09	36.2
4/14/01 16:17	22.09	35.7
4/14/01 16:19	22.09	36.2
4/14/01 16:21	22.09	36.2
4/14/01 16:23	22.09	36.2
4/14/01 16:25	22.09	36.2
4/14/01 16:27	22.09	36.2
4/14/01 16:29	22.09	36.2
4/14/01 16:31	22.09	36.2
4/14/01 16:33	22.09	36.2
4/14/01 16:35	22.09	36.2
4/14/01 16:37	22.09	36.2
4/14/01 16:39	22.09	36.7
4/14/01 16:41	22.09	36.7
4/14/01 16:43	22.09	36.2
4/14/01 16:45	22.09	36.7
4/14/01 16:47	22.09	36.7
4/14/01 16:49	22.09	36.7
4/14/01 16:51	22.09	36.7
4/14/01 16:53	22.09	36.7
4/14/01 16:55	22.09	36.7
4/14/01 16:57	22.09	36.7
4/14/01 16:59	22.09	36.7
4/14/01 17:01	22.09	36.7
4/14/01 17:03	22.09	37.2
4/14/01 17:05	22.09	36.7
4/14/01 17:07	22.09	36.7
4/14/01 17:09	22.09	36.7
4/14/01 17:11	22.09	37.2
4/14/01 17:13	22.09	37.2
4/14/01 17:15	22.09	37.2
4/14/01 17:17	22.09	37.2
4/14/01 17:19	22.09	37.2
4/14/01 17:21	22.09	37.2
4/14/01 17:23	22.09	37.2
4/14/01 17:25	22.09	37.2
4/14/01 17:27	22.09	37.2
4/14/01 17:29	22.09	37.2
4/14/01 17:31	22.09	37.2
4/14/01 17:33	22.09	37.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 17:35	22.09	37.2
4/14/01 17:37	22.09	37.2
4/14/01 17:39	22.09	37.2
4/14/01 17:41	22.09	37.2
4/14/01 17:43	22.09	37.2
4/14/01 17:45	22.09	37.7
4/14/01 17:47	22.09	37.2
4/14/01 17:49	22.09	37.7
4/14/01 17:51	22.09	37.7
4/14/01 17:53	22.09	37.7
4/14/01 17:55	22.09	37.7
4/14/01 17:57	22.09	37.7
4/14/01 17:59	22.09	37.7
4/14/01 18:01	22.09	37.7
4/14/01 18:03	22.09	37.7
4/14/01 18:05	22.09	37.7
4/14/01 18:07	22.09	37.7
4/14/01 18:09	22.09	37.7
4/14/01 18:11	22.09	37.7
4/14/01 18:13	22.09	37.7
4/14/01 18:15	22.09	37.7
4/14/01 18:17	22.09	37.7
4/14/01 18:19	22.09	37.7
4/14/01 18:21	22.09	37.7
4/14/01 18:23	22.09	37.7
4/14/01 18:25	22.09	37.7
4/14/01 18:27	22.09	37.7
4/14/01 18:29	22.09	37.7
4/14/01 18:31	22.09	38.2
4/14/01 18:33	22.09	38.2
4/14/01 18:35	22.09	38.2
4/14/01 18:37	22.09	38.2
4/14/01 18:39	22.09	38.2
4/14/01 18:41	22.09	38.2
4/14/01 18:43	22.09	38.2
4/14/01 18:45	22.09	38.2
4/14/01 18:47	22.09	38.2
4/14/01 18:49	22.09	38.2
4/14/01 18:51	22.09	38.2
4/14/01 18:53	22.09	38.2
4/14/01 18:55	22.09	38.2
4/14/01 18:57	22.09	38.2
4/14/01 18:59	22.09	38.2
4/14/01 19:01	22.09	38.2
4/14/01 19:03	22.09	38.2
4/14/01 19:05	22.09	38.2
4/14/01 19:07	22.09	38.2
4/14/01 19:09	22.09	38.2
4/14/01 19:11	22.09	38.2
4/14/01 19:13	22.09	38.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 19:15	22.09	38.2
4/14/01 19:17	22.09	38.2
4/14/01 19:19	22.09	38.2
4/14/01 19:21	22.09	38.2
4/14/01 19:23	22.09	38.2
4/14/01 19:25	22.09	38.2
4/14/01 19:27	22.09	38.2
4/14/01 19:29	22.09	38.7
4/14/01 19:31	22.09	38.7
4/14/01 19:33	22.09	38.7
4/14/01 19:35	22.09	38.7
4/14/01 19:37	22.09	38.7
4/14/01 19:39	22.09	38.7
4/14/01 19:41	22.09	38.7
4/14/01 19:43	22.09	38.7
4/14/01 19:45	22.09	38.7
4/14/01 19:47	22.09	38.7
4/14/01 19:49	22.09	38.7
4/14/01 19:51	22.09	38.7
4/14/01 19:53	22.09	38.7
4/14/01 19:55	22.09	38.7
4/14/01 19:57	22.09	38.7
4/14/01 19:59	22.09	38.7
4/14/01 20:01	22.09	38.7
4/14/01 20:03	22.09	38.7
4/14/01 20:05	22.09	38.7
4/14/01 20:07	22.09	38.7
4/14/01 20:09	22.09	38.7
4/14/01 20:11	22.09	38.7
4/14/01 20:13	22.09	38.7
4/14/01 20:15	22.09	38.7
4/14/01 20:17	22.09	38.7
4/14/01 20:19	22.09	38.7
4/14/01 20:21	22.09	38.7
4/14/01 20:23	22.09	38.7
4/14/01 20:25	22.09	38.7
4/14/01 20:27	22.09	38.7
4/14/01 20:29	22.09	38.7
4/14/01 20:31	22.09	38.7
4/14/01 20:33	22.09	38.7
4/14/01 20:35	22.09	38.7
4/14/01 20:37	22.09	38.7
4/14/01 20:39	22.09	38.7
4/14/01 20:41	22.09	38.7
4/14/01 20:43	22.09	38.7
4/14/01 20:45	22.09	39.2
4/14/01 20:47	22.09	39.2
4/14/01 20:49	22.09	39.2
4/14/01 20:51	22.09	39.2
4/14/01 20:53	22.09	39.2

Date And Time	Temperature (º C)	RH (%)
4/14/01 20:55	22.09	39.2
4/14/01 20:57	22.09	38.7
4/14/01 20:59	22.09	39.2
4/14/01 21:01	22.09	39.2
4/14/01 21:03	22.09	39.2
4/14/01 21:05	22.09	39.2
4/14/01 21:07	22.09	39.2
4/14/01 21:09	22.09	39.2
4/14/01 21:11	22.09	39.2
4/14/01 21:13	22.09	39.2
4/14/01 21:15	22.09	39.2
4/14/01 21:17	22.09	39.2
4/14/01 21:19	22.09	38.7
4/14/01 21:21	22.09	39.2
4/14/01 21:23	22.09	39.2
4/14/01 21:25	22.09	39.2
4/14/01 21:27	22.09	39.2
4/14/01 21:29	22.09	39.2
4/14/01 21:31	22.09	39.2
4/14/01 21:33	22.09	39.2
4/14/01 21:35	22.09	39.2
4/14/01 21:37	22.09	39.2
4/14/01 21:39	22.09	39.2
4/14/01 21:41	22.09	39.2
4/14/01 21:43	22.09	39.2
4/14/01 21:45	22.09	39.2
4/14/01 21:47	22.09	39.2
4/14/01 21:49	22.09	39.2
4/14/01 21:51	22.09	39.2
4/14/01 21:53	22.09	39.2
4/14/01 21:55	22.09	39.2
4/14/01 21:57	22.09	39.2
4/14/01 21:59	22.09	39.2
4/14/01 22:01	22.09	39.2
4/14/01 22:03	22.09	39.2
4/14/01 22:05	22.09	39.2
4/14/01 22:07	22.09	39.2
4/14/01 22:09	22.09	39.2
4/14/01 22:11	22.09	39.2
4/14/01 22:13	22.09	39.2
4/14/01 22:15	22.09	39.2
4/14/01 22:17	22.09	39.2
4/14/01 22:19	22.09	39.2
4/14/01 22:21	22.09	39.2
4/14/01 22:23	22.09	39.2
4/14/01 22:25	22.09	39.2
4/14/01 22:27	22.09	39.2
4/14/01 22:29	22.09	39.2
4/14/01 22:31	22.09	39.2
4/14/01 22:33	22.09	39.2

Date And Time	Temperature (° C)	RH (%)
4/14/01 22:35	22.09	39.2
4/14/01 22:37	22.09	39.2
4/14/01 22:39	22.09	38.7
4/14/01 22:41	22.09	39.2
4/14/01 22:43	22.09	39.2
4/14/01 22:45	22.09	39.2
4/14/01 22:47	22.09	39.2
4/14/01 22:49	22.09	39.2
4/14/01 22:51	22.09	39.2
4/14/01 22:53	22.09	39.2
4/14/01 22:55	22.09	38.7
4/14/01 22:57	22.09	39.7
4/14/01 22:59	22.09	39.7
4/14/01 23:01	22.09	39.7
4/14/01 23:03	22.09	39.7
4/14/01 23:05	22.09	39.2
4/14/01 23:07	22.09	39.7
4/14/01 23:09	22.09	39.7
4/14/01 23:11	22.09	39.2
4/14/01 23:13	22.09	39.7
4/14/01 23:15	22.09	39.2
4/14/01 23:17	22.09	39.2
4/14/01 23:19	22.09	39.2
4/14/01 23:21	22.09	39.2
4/14/01 23:23	22.09	39.7
4/14/01 23:25	22.09	39.2
4/14/01 23:27	22.09	39.7
4/14/01 23:29	22.09	39.7
4/14/01 23:31	22.09	39.7
4/14/01 23:33	22.09	39.7
4/14/01 23:35	22.09	39.7
4/14/01 23:37	22.09	39.2
4/14/01 23:39	22.09	39.2
4/14/01 23:41	22.09	39.7
4/14/01 23:43	22.09	39.2
4/14/01 23:45	22.09	39.2
4/14/01 23:47	22.09	39.2
4/14/01 23:49	22.09	39.7
4/14/01 23:51	22.09	39.7
4/14/01 23:53	22.09	39.2
4/14/01 23:55	22.09	39.7
4/14/01 23:57	22.09	39.2
4/14/01 23:59	22.09	39.2
4/15/01 0:01	22.09	39.2
4/15/01 0:03	22.09	39.7
4/15/01 0:05	22.09	39.7
4/15/01 0:07	22.09	39.2
4/15/01 0:09	22.09	39.2
4/15/01 0:11	22.09	39.2
4/15/01 0:13	22.09	39.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 0:15	22.09	39.7
4/15/01 0:17	22.09	39.2
4/15/01 0:19	22.09	39.7
4/15/01 0:21	22.09	39.2
4/15/01 0:23	22.09	39.2
4/15/01 0:25	22.09	39.2
4/15/01 0:27	22.09	39.2
4/15/01 0:29	22.09	39.7
4/15/01 0:31	22.09	39.7
4/15/01 0:33	22.09	39.2
4/15/01 0:35	22.09	39.7
4/15/01 0:37	22.09	39.2
4/15/01 0:39	22.09	39.7
4/15/01 0:41	22.09	39.2
4/15/01 0:43	22.09	39.7
4/15/01 0:45	22.09	39.7
4/15/01 0:47	22.09	39.2
4/15/01 0:49	22.09	39.7
4/15/01 0:51	22.09	39.2
4/15/01 0:53	22.09	39.7
4/15/01 0:55	22.09	39.7
4/15/01 0:57	22.09	39.7
4/15/01 0:59	22.09	39.7
4/15/01 1:01	22.09	39.7
4/15/01 1:03	22.09	39.7
4/15/01 1:05	22.09	39.7
4/15/01 1:07	22.09	39.7
4/15/01 1:09	22.09	39.7
4/15/01 1:11	22.09	39.7
4/15/01 1:13	22.09	39.7
4/15/01 1:15	22.09	39.7
4/15/01 1:17	22.09	39.7
4/15/01 1:19	22.09	39.7
4/15/01 1:21	22.09	39.7
4/15/01 1:23	22.09	39.7
4/15/01 1:25	22.09	39.7
4/15/01 1:27	22.09	39.7
4/15/01 1:29	22.09	39.7
4/15/01 1:31	22.09	39.7
4/15/01 1:33	22.09	39.7
4/15/01 1:35	22.09	39.7
4/15/01 1:37	22.09	39.7
4/15/01 1:39	22.09	39.7
4/15/01 1:41	22.09	39.7
4/15/01 1:43	22.09	39.7
4/15/01 1:45	22.09	39.7
4/15/01 1:47	22.09	39.7
4/15/01 1:49	22.09	39.7
4/15/01 1:51	22.09	39.7
4/15/01 1:53	22.09	39.7

Date And Time	Temperature (° C)	RH (%)
4/15/01 1:55	22.09	39.7
4/15/01 1:57	22.09	40.2
4/15/01 1:59	22.09	40.2
4/15/01 2:01	22.09	40.2
4/15/01 2:03	22.09	40.2
4/15/01 2:05	22.09	40.2
4/15/01 2:07	22.09	40.2
4/15/01 2:09	22.09	40.2
4/15/01 2:11	22.09	40.2
4/15/01 2:13	22.09	40.2
4/15/01 2:15	22.09	40.2
4/15/01 2:17	22.09	40.2
4/15/01 2:19	22.09	40.2
4/15/01 2:21	22.09	40.2
4/15/01 2:23	22.09	40.2
4/15/01 2:25	22.09	40.2
4/15/01 2:27	22.09	40.2
4/15/01 2:29	22.09	40.2
4/15/01 2:31	22.09	40.2
4/15/01 2:33	22.09	40.2
4/15/01 2:35	22.09	40.2
4/15/01 2:37	22.09	40.2
4/15/01 2:39	22.09	39.7
4/15/01 2:41	22.09	40.2
4/15/01 2:43	22.09	40.2
4/15/01 2:45	22.09	40.2
4/15/01 2:47	22.09	40.2
4/15/01 2:49	22.09	40.2
4/15/01 2:51	22.09	40.2
4/15/01 2:53	22.09	40.2
4/15/01 2:55	22.09	40.2
4/15/01 2:57	22.09	40.2
4/15/01 2:59	22.09	40.2
4/15/01 3:01	22.09	40.2
4/15/01 3:03	22.09	40.2
4/15/01 3:05	22.09	40.2
4/15/01 3:07	22.09	40.2
4/15/01 3:09	22.09	40.2
4/15/01 3:11	22.09	40.2
4/15/01 3:13	22.09	40.2
4/15/01 3:15	22.09	40.2
4/15/01 3:17	22.09	40.2
4/15/01 3:19	22.09	40.2
4/15/01 3:21	22.09	40.2
4/15/01 3:23	22.09	40.2
4/15/01 3:25	22.09	40.2
4/15/01 3:27	22.09	40.2
4/15/01 3:29	22.09	40.2
4/15/01 3:31	22.09	40.2
4/15/01 3:33	22.09	40.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 3:35	22.09	40.2
4/15/01 3:37	22.09	40.2
4/15/01 3:39	22.09	40.2
4/15/01 3:41	22.09	40.2
4/15/01 3:43	22.09	39.7
4/15/01 3:45	22.09	40.2
4/15/01 3:47	22.09	40.2
4/15/01 3:49	22.09	40.2
4/15/01 3:51	22.09	40.2
4/15/01 3:53	22.09	40.2
4/15/01 3:55	22.09	40.2
4/15/01 3:57	22.09	40.2
4/15/01 3:59	22.09	40.2
4/15/01 4:01	22.09	40.2
4/15/01 4:03	22.09	40.2
4/15/01 4:05	22.09	40.2
4/15/01 4:07	22.09	40.2
4/15/01 4:09	22.09	40.2
4/15/01 4:11	22.09	40.2
4/15/01 4:13	22.09	40.2
4/15/01 4:15	22.09	40.2
4/15/01 4:17	22.09	40.2
4/15/01 4:19	22.09	40.2
4/15/01 4:21	22.09	40.2
4/15/01 4:23	22.09	40.2
4/15/01 4:25	22.09	40.2
4/15/01 4:27	22.09	40.2
4/15/01 4:29	22.09	40.2
4/15/01 4:31	22.09	40.2
4/15/01 4:33	22.09	40.2
4/15/01 4:35	22.09	40.2
4/15/01 4:37	22.09	40.2
4/15/01 4:39	22.09	40.2
4/15/01 4:41	22.09	40.2
4/15/01 4:43	22.09	40.2
4/15/01 4:45	22.09	40.2
4/15/01 4:47	22.09	40.2
4/15/01 4:49	22.09	40.2
4/15/01 4:51	22.09	40.2
4/15/01 4:53	22.09	40.2
4/15/01 4:55	22.09	40.2
4/15/01 4:57	22.09	40.2
4/15/01 4:59	22.09	40.2
4/15/01 5:01	22.09	40.2
4/15/01 5:03	22.09	40.2
4/15/01 5:05	22.09	40.2
4/15/01 5:07	22.09	40.2
4/15/01 5:09	22.09	40.2
4/15/01 5:11	22.09	40.2
4/15/01 5:13	22.09	40.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 5:15	22.09	40.2
4/15/01 5:17	22.09	40.2
4/15/01 5:19	22.09	40.2
4/15/01 5:21	22.09	40.2
4/15/01 5:23	22.09	40.2
4/15/01 5:25	22.09	40.2
4/15/01 5:27	22.09	40.2
4/15/01 5:29	22.09	40.2
4/15/01 5:31	22.09	40.2
4/15/01 5:33	22.09	40.2
4/15/01 5:35	22.09	40.2
4/15/01 5:37	22.09	40.2
4/15/01 5:39	22.09	40.2
4/15/01 5:41	22.09	40.2
4/15/01 5:43	22.09	40.2
4/15/01 5:45	22.09	40.2
4/15/01 5:47	22.09	40.2
4/15/01 5:49	22.09	40.2
4/15/01 5:51	22.09	40.2
4/15/01 5:53	22.09	40.2
4/15/01 5:55	22.09	40.2
4/15/01 5:57	22.09	40.2
4/15/01 5:59	22.09	40.2
4/15/01 6:01	22.09	40.2
4/15/01 6:03	22.09	40.2
4/15/01 6:05	22.09	40.2
4/15/01 6:07	22.09	40.2
4/15/01 6:09	22.09	40.2
4/15/01 6:11	22.09	40.2
4/15/01 6:13	22.09	40.2
4/15/01 6:15	22.09	40.2
4/15/01 6:17	22.09	40.2
4/15/01 6:19	22.09	40.2
4/15/01 6:21	22.09	40.2
4/15/01 6:23	22.09	40.2
4/15/01 6:25	22.09	40.2
4/15/01 6:27	22.09	40.2
4/15/01 6:29	22.09	40.2
4/15/01 6:31	22.09	40.2
4/15/01 6:33	22.09	40.2
4/15/01 6:35	22.09	40.2
4/15/01 6:37	22.09	40.2
4/15/01 6:39	22.09	40.2
4/15/01 6:41	22.09	40.2
4/15/01 6:43	22.09	40.2
4/15/01 6:45	22.09	40.2
4/15/01 6:47	22.09	40.2
4/15/01 6:49	22.09	40.2
4/15/01 6:51	22.09	40.2
4/15/01 6:53	22.09	40.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 6:55	22.09	40.2
4/15/01 6:57	22.09	40.2
4/15/01 6:59	22.09	40.2
4/15/01 7:01	22.09	40.2
4/15/01 7:03	22.09	40.2
4/15/01 7:05	22.09	40.2
4/15/01 7:07	22.09	40.2
4/15/01 7:09	22.09	40.2
4/15/01 7:11	22.09	40.2
4/15/01 7:13	22.09	40.2
4/15/01 7:15	22.09	40.2
4/15/01 7:17	22.09	40.2
4/15/01 7:19	22.09	40.2
4/15/01 7:21	22.09	40.2
4/15/01 7:23	22.09	40.2
4/15/01 7:25	22.09	40.2
4/15/01 7:27	22.09	40.2
4/15/01 7:29	22.09	40.2
4/15/01 7:31	22.09	40.2
4/15/01 7:33	22.09	40.2
4/15/01 7:35	22.09	40.2
4/15/01 7:37	22.09	40.2
4/15/01 7:39	22.09	40.2
4/15/01 7:41	22.09	40.2
4/15/01 7:43	22.09	40.2
4/15/01 7:45	22.09	40.2
4/15/01 7:47	22.09	40.2
4/15/01 7:49	22.09	40.2
4/15/01 7:51	22.09	40.2
4/15/01 7:53	22.09	40.2
4/15/01 7:55	22.09	40.2
4/15/01 7:57	22.09	40.2
4/15/01 7:59	22.09	40.7
4/15/01 8:01	22.09	40.2
4/15/01 8:03	22.09	40.2
4/15/01 8:05	22.09	40.2
4/15/01 8:07	22.09	40.2
4/15/01 8:09	22.09	40.2
4/15/01 8:11	22.09	40.2
4/15/01 8:13	22.09	40.2
4/15/01 8:15	22.09	40.2
4/15/01 8:17	22.09	40.2
4/15/01 8:19	22.09	40.2
4/15/01 8:21	22.09	40.2
4/15/01 8:23	22.09	40.2
4/15/01 8:25	22.09	40.2
4/15/01 8:27	22.09	40.2
4/15/01 8:29	22.09	40.2
4/15/01 8:31	22.09	40.2
4/15/01 8:33	22.09	40.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 8:35	22.09	40.2
4/15/01 8:37	22.09	40.2
4/15/01 8:39	22.09	40.2
4/15/01 8:41	22.09	40.2
4/15/01 8:43	22.09	40.2
4/15/01 8:45	22.09	40.2
4/15/01 8:47	22.09	40.2
4/15/01 8:49	22.09	40.2
4/15/01 8:51	22.09	40.2
4/15/01 8:53	22.09	40.2
4/15/01 8:55	22.09	40.2
4/15/01 8:57	22.09	40.2
4/15/01 8:59	22.09	40.2
4/15/01 9:01	22.09	40.7
4/15/01 9:03	22.09	40.7
4/15/01 9:05	22.09	40.7
4/15/01 9:07	22.09	40.7
4/15/01 9:09	22.09	40.7
4/15/01 9:11	22.09	40.7
4/15/01 9:13	22.09	40.7
4/15/01 9:15	22.09	40.7
4/15/01 9:17	22.09	40.7
4/15/01 9:19	22.09	40.7
4/15/01 9:21	22.09	40.7
4/15/01 9:23	22.09	40.7
4/15/01 9:25	22.09	40.7
4/15/01 9:27	22.09	40.7
4/15/01 9:29	22.09	40.7
4/15/01 9:31	22.09	40.7
4/15/01 9:33	22.09	40.7
4/15/01 9:35	22.09	40.7
4/15/01 9:37	22.09	40.7
4/15/01 9:39	22.09	40.7
4/15/01 9:41	22.09	40.7
4/15/01 9:43	22.09	40.7
4/15/01 9:45	22.09	40.7
4/15/01 9:47	22.09	40.7
4/15/01 9:49	22.09	40.7
4/15/01 9:51	22.09	40.7
4/15/01 9:53	22.09	40.7
4/15/01 9:55	22.09	40.7
4/15/01 9:57	22.09	40.7
4/15/01 9:59	22.09	40.7
4/15/01 10:01	22.09	40.7
4/15/01 10:03	22.09	40.7
4/15/01 10:05	22.09	40.7
4/15/01 10:07	22.09	40.2
4/15/01 10:09	22.09	40.7
4/15/01 10:11	22.09	40.7
4/15/01 10:13	22.09	40.7

Date And Time	Temperature (° C)	RH (%)
4/15/01 10:15	22.09	40.7
4/15/01 10:17	22.09	40.7
4/15/01 10:19	22.09	40.7
4/15/01 10:21	22.09	40.7
4/15/01 10:23	22.09	40.7
4/15/01 10:25	22.09	40.7
4/15/01 10:27	22.09	40.7
4/15/01 10:29	22.09	40.7
4/15/01 10:31	22.09	40.7
4/15/01 10:33	22.09	40.7
4/15/01 10:35	22.09	40.7
4/15/01 10:37	22.09	40.7
4/15/01 10:39	22.09	40.7
4/15/01 10:41	22.09	40.7
4/15/01 10:43	22.09	40.7
4/15/01 10:45	22.09	40.7
4/15/01 10:47	22.09	40.7
4/15/01 10:49	22.09	40.7
4/15/01 10:51	22.09	40.7
4/15/01 10:53	22.09	40.7
4/15/01 10:55	22.09	40.7
4/15/01 10:57	22.09	40.7
4/15/01 10:59	22.09	40.7
4/15/01 11:01	22.09	40.7
4/15/01 11:03	22.09	40.7
4/15/01 11:05	22.09	40.7
4/15/01 11:07	22.09	40.7
4/15/01 11:09	22.09	40.7
4/15/01 11:11	22.09	40.7
4/15/01 11:13	22.09	40.7
4/15/01 11:15	22.09	40.7
4/15/01 11:17	22.09	40.7
4/15/01 11:19	22.09	40.7
4/15/01 11:21	22.09	40.7
4/15/01 11:23	22.09	40.7
4/15/01 11:25	22.09	40.7
4/15/01 11:27	22.09	40.7
4/15/01 11:29	22.09	40.7
4/15/01 11:31	22.09	40.7
4/15/01 11:33	22.09	40.7
4/15/01 11:35	22.09	40.7
4/15/01 11:37	22.09	40.7
4/15/01 11:39	22.09	40.7
4/15/01 11:41	22.09	40.7
4/15/01 11:43	22.09	40.7
4/15/01 11:45	22.09	40.7
4/15/01 11:47	22.09	40.7
4/15/01 11:49	22.09	40.7
4/15/01 11:51	22.09	40.7
4/15/01 11:53	22.09	40.7

Date And Time	Temperature (° C)	RH (%)
4/15/01 11:55	22.09	40.7
4/15/01 11:57	22.09	40.7
4/15/01 11:59	22.09	40.7
4/15/01 12:01	22.09	40.7
4/15/01 12:03	22.09	40.7
4/15/01 12:05	22.09	40.7
4/15/01 12:07	22.09	40.7
4/15/01 12:09	22.09	40.7
4/15/01 12:11	22.09	40.7
4/15/01 12:13	22.09	40.7
4/15/01 12:15	22.09	40.7
4/15/01 12:17	22.09	40.7
4/15/01 12:19	22.09	40.7
4/15/01 12:21	22.09	40.7
4/15/01 12:23	22.09	40.7
4/15/01 12:25	22.09	40.7
4/15/01 12:27	22.09	40.7
4/15/01 12:29	22.09	40.7
4/15/01 12:31	22.09	40.7
4/15/01 12:33	22.09	40.7
4/15/01 12:35	22.09	40.7
4/15/01 12:37	22.09	40.7
4/15/01 12:39	22.09	40.7
4/15/01 12:41	22.09	40.7
4/15/01 12:43	22.09	40.7
4/15/01 12:45	22.09	40.7
4/15/01 12:47	22.09	40.7
4/15/01 12:49	22.09	40.7
4/15/01 12:51	22.09	40.7
4/15/01 12:53	22.09	40.7
4/15/01 12:55	22.09	40.7
4/15/01 12:57	22.09	40.7
4/15/01 12:59	22.09	40.7
4/15/01 13:01	22.09	40.7
4/15/01 13:03	22.09	40.7
4/15/01 13:05	22.09	40.7
4/15/01 13:07	22.09	40.7
4/15/01 13:09	22.09	40.7
4/15/01 13:11	22.09	40.7
4/15/01 13:13	22.09	40.7
4/15/01 13:15	22.09	40.7
4/15/01 13:17	22.09	40.7
4/15/01 13:19	22.09	40.7
4/15/01 13:21	22.09	40.7
4/15/01 13:23	22.09	40.7
4/15/01 13:25	22.09	40.7
4/15/01 13:27	22.09	40.7
4/15/01 13:29	22.09	40.7
4/15/01 13:31	22.09	40.7
4/15/01 13:33	22.09	40.7

Date And Time	Temperature (° C)	RH (%)
4/15/01 13:35	22.09	40.7
4/15/01 13:37	22.09	40.7
4/15/01 13:39	22.09	40.7
4/15/01 13:41	22.09	40.7
4/15/01 13:43	22.09	40.7
4/15/01 13:45	22.09	40.7
4/15/01 13:47	22.09	40.7
4/15/01 13:49	22.09	40.7
4/15/01 13:51	22.09	40.7
4/15/01 13:53	22.09	40.7
4/15/01 13:55	22.09	40.7
4/15/01 13:57	22.09	40.7
4/15/01 13:59	22.09	40.7
4/15/01 14:01	22.09	40.7
4/15/01 14:03	22.09	40.7
4/15/01 14:05	22.09	40.7
4/15/01 14:07	22.09	40.7
4/15/01 14:09	22.09	40.7
4/15/01 14:11	22.09	40.7
4/15/01 14:13	22.09	40.7
4/15/01 14:15	22.09	40.7
4/15/01 14:17	22.09	40.7
4/15/01 14:19	22.09	40.7
4/15/01 14:21	22.09	40.7
4/15/01 14:23	22.09	40.7
4/15/01 14:25	22.09	40.7
4/15/01 14:27	22.09	40.7
4/15/01 14:29	22.09	40.7
4/15/01 14:31	22.09	40.7
4/15/01 14:33	22.09	40.7
4/15/01 14:35	22.09	40.7
4/15/01 14:37	22.09	40.7
4/15/01 14:39	22.09	40.7
4/15/01 14:41	22.09	40.7
4/15/01 14:43	22.09	40.7
4/15/01 14:45	22.09	40.7
4/15/01 14:47	22.09	40.7
4/15/01 14:49	22.09	40.7
4/15/01 14:51	22.09	40.7
4/15/01 14:53	22.09	40.7
4/15/01 14:55	22.09	40.7
4/15/01 14:57	22.09	40.7
4/15/01 14:59	22.09	40.7
4/15/01 15:01	22.09	40.7
4/15/01 15:03	22.09	40.7
4/15/01 15:05	22.09	41.2
4/15/01 15:07	22.09	40.7
4/15/01 15:09	22.09	40.7
4/15/01 15:11	22.09	40.7
4/15/01 15:13	22.09	40.7

Date And Time	Temperature (° C)	RH (%)
4/15/01 15:15	22.09	40.7
4/15/01 15:17	22.09	40.7
4/15/01 15:19	22.09	40.7
4/15/01 15:21	22.09	40.7
4/15/01 15:23	22.09	40.7
4/15/01 15:25	22.09	40.7
4/15/01 15:27	22.09	41.2
4/15/01 15:29	22.09	40.7
4/15/01 15:31	22.09	40.7
4/15/01 15:33	22.09	40.7
4/15/01 15:35	22.09	40.7
4/15/01 15:37	22.09	40.7
4/15/01 15:39	22.09	40.7
4/15/01 15:41	22.09	40.7
4/15/01 15:43	22.09	40.7
4/15/01 15:45	22.09	40.7
4/15/01 15:47	22.09	40.7
4/15/01 15:49	22.09	40.7
4/15/01 15:51	22.09	40.7
4/15/01 15:53	22.09	40.7
4/15/01 15:55	22.09	41.2
4/15/01 15:57	22.09	41.2
4/15/01 15:59	22.09	41.2
4/15/01 16:01	22.09	41.2
4/15/01 16:03	22.09	41.2
4/15/01 16:05	22.09	41.2
4/15/01 16:07	22.09	41.2
4/15/01 16:09	22.09	40.7
4/15/01 16:11	22.09	41.2
4/15/01 16:13	22.09	41.2
4/15/01 16:15	22.09	41.2
4/15/01 16:17	22.09	41.2
4/15/01 16:19	22.09	41.2
4/15/01 16:21	22.09	41.2
4/15/01 16:23	22.09	41.2
4/15/01 16:25	22.09	41.2
4/15/01 16:27	22.09	41.2
4/15/01 16:29	22.09	41.2
4/15/01 16:31	22.09	40.7
4/15/01 16:33	22.09	41.2
4/15/01 16:35	22.09	41.2
4/15/01 16:37	22.09	41.2
4/15/01 16:39	22.09	41.2
4/15/01 16:41	22.09	41.2
4/15/01 16:43	22.09	41.2
4/15/01 16:45	22.09	41.2
4/15/01 16:47	22.09	41.2
4/15/01 16:49	22.09	41.2
4/15/01 16:51	22.09	41.2
4/15/01 16:53	22.09	41.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 16:55	22.09	41.2
4/15/01 16:57	22.09	41.2
4/15/01 16:59	22.09	41.2
4/15/01 17:01	22.09	41.2
4/15/01 17:03	22.09	41.2
4/15/01 17:05	22.09	41.2
4/15/01 17:07	22.09	41.2
4/15/01 17:09	22.09	41.2
4/15/01 17:11	22.09	41.2
4/15/01 17:13	22.09	41.2
4/15/01 17:15	22.09	41.2
4/15/01 17:17	22.09	41.2
4/15/01 17:19	22.09	41.2
4/15/01 17:21	22.09	41.2
4/15/01 17:23	22.09	41.2
4/15/01 17:25	22.09	41.2
4/15/01 17:27	22.09	41.2
4/15/01 17:29	22.09	41.2
4/15/01 17:31	22.09	41.2
4/15/01 17:33	22.09	41.2
4/15/01 17:35	22.09	40.7
4/15/01 17:37	22.09	41.2
4/15/01 17:39	22.09	41.2
4/15/01 17:41	22.09	41.2
4/15/01 17:43	22.09	41.2
4/15/01 17:45	22.09	41.2
4/15/01 17:47	22.09	41.2
4/15/01 17:49	22.09	41.2
4/15/01 17:51	22.09	41.2
4/15/01 17:53	22.09	41.2
4/15/01 17:55	22.09	41.2
4/15/01 17:57	22.09	41.2
4/15/01 17:59	22.09	41.2
4/15/01 18:01	22.09	41.2
4/15/01 18:03	22.09	41.2
4/15/01 18:05	22.09	41.2
4/15/01 18:07	22.09	41.2
4/15/01 18:09	22.09	41.2
4/15/01 18:11	22.09	41.2
4/15/01 18:13	22.09	41.2
4/15/01 18:15	22.09	41.2
4/15/01 18:17	22.09	41.2
4/15/01 18:19	22.09	41.2
4/15/01 18:21	22.09	41.2
4/15/01 18:23	22.09	41.2
4/15/01 18:25	22.09	41.2
4/15/01 18:27	22.09	41.2
4/15/01 18:29	22.09	41.2
4/15/01 18:31	22.09	41.2
4/15/01 18:33	22.09	41.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 18:35	22.09	41.2
4/15/01 18:37	22.09	41.2
4/15/01 18:39	22.09	40.7
4/15/01 18:41	22.09	41.2
4/15/01 18:43	22.09	41.2
4/15/01 18:45	22.09	41.2
4/15/01 18:47	22.09	41.2
4/15/01 18:49	22.09	41.2
4/15/01 18:51	22.09	41.2
4/15/01 18:53	22.09	41.2
4/15/01 18:55	22.09	41.2
4/15/01 18:57	22.09	41.2
4/15/01 18:59	22.09	41.2
4/15/01 19:01	22.09	41.2
4/15/01 19:03	22.09	41.2
4/15/01 19:05	22.09	41.2
4/15/01 19:07	22.09	41.2
4/15/01 19:09	22.09	41.2
4/15/01 19:11	22.09	41.2
4/15/01 19:13	22.09	41.2
4/15/01 19:15	22.09	41.2
4/15/01 19:17	22.09	41.2
4/15/01 19:19	22.09	41.2
4/15/01 19:21	22.09	41.2
4/15/01 19:23	22.09	41.2
4/15/01 19:25	22.09	41.2
4/15/01 19:27	22.09	41.2
4/15/01 19:29	22.09	41.2
4/15/01 19:31	22.09	41.2
4/15/01 19:33	22.09	41.2
4/15/01 19:35	22.09	41.2
4/15/01 19:37	22.09	41.2
4/15/01 19:39	22.09	41.2
4/15/01 19:41	22.09	41.2
4/15/01 19:43	22.09	41.2
4/15/01 19:45	22.09	41.2
4/15/01 19:47	22.09	41.2
4/15/01 19:49	22.09	41.2
4/15/01 19:51	22.09	41.2
4/15/01 19:53	22.09	41.2
4/15/01 19:55	22.09	41.2
4/15/01 19:57	22.09	41.2
4/15/01 19:59	22.09	41.2
4/15/01 20:01	22.09	41.2
4/15/01 20:03	22.09	41.2
4/15/01 20:05	22.09	41.2
4/15/01 20:07	22.09	41.2
4/15/01 20:09	22.09	41.2
4/15/01 20:11	22.09	41.2
4/15/01 20:13	22.09	41.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 20:15	22.09	41.2
4/15/01 20:17	22.09	41.2
4/15/01 20:19	22.09	41.2
4/15/01 20:21	22.09	41.2
4/15/01 20:23	22.09	41.2
4/15/01 20:25	22.09	41.2
4/15/01 20:27	22.09	41.2
4/15/01 20:29	22.09	41.2
4/15/01 20:31	22.09	41.2
4/15/01 20:33	22.09	41.2
4/15/01 20:35	22.09	41.2
4/15/01 20:37	22.09	41.2
4/15/01 20:39	22.09	41.2
4/15/01 20:41	22.09	41.2
4/15/01 20:43	22.09	41.2
4/15/01 20:45	22.09	41.2
4/15/01 20:47	22.09	41.2
4/15/01 20:49	22.09	41.2
4/15/01 20:51	22.09	41.2
4/15/01 20:53	22.09	41.2
4/15/01 20:55	22.09	41.2
4/15/01 20:57	22.09	41.2
4/15/01 20:59	22.09	41.2
4/15/01 21:01	22.09	41.2
4/15/01 21:03	22.09	41.2
4/15/01 21:05	22.09	41.2
4/15/01 21:07	22.09	41.2
4/15/01 21:09	22.09	41.2
4/15/01 21:11	22.09	41.2
4/15/01 21:13	22.09	41.2
4/15/01 21:15	22.09	41.2
4/15/01 21:17	22.09	41.2
4/15/01 21:19	22.09	41.2
4/15/01 21:21	22.09	41.2
4/15/01 21:23	22.09	41.2
4/15/01 21:25	22.09	41.2
4/15/01 21:27	22.09	41.2
4/15/01 21:29	22.09	41.2
4/15/01 21:31	22.09	41.2
4/15/01 21:33	22.09	41.2
4/15/01 21:35	22.09	41.2
4/15/01 21:37	22.09	41.2
4/15/01 21:39	22.09	41.2
4/15/01 21:41	22.09	41.2
4/15/01 21:43	22.09	41.2
4/15/01 21:45	22.09	41.2
4/15/01 21:47	22.09	41.2
4/15/01 21:49	22.09	41.2
4/15/01 21:51	22.09	41.2
4/15/01 21:53	22.09	41.2

Date And Time	Temperature (° C)	RH (%)
4/15/01 21:55	22.09	41.2
4/15/01 21:57	22.09	41.2
4/15/01 21:59	22.09	41.2
4/15/01 22:01	22.09	41.2
4/15/01 22:03	22.09	41.2
4/15/01 22:05	22.09	41.2
4/15/01 22:07	22.09	41.2
4/15/01 22:09	22.09	41.2
4/15/01 22:11	22.09	41.2
4/15/01 22:13	22.09	41.2
4/15/01 22:15	22.09	41.2
4/15/01 22:17	22.09	41.2
4/15/01 22:19	22.09	41.2
4/15/01 22:21	22.09	41.2
4/15/01 22:23	22.09	41.2
4/15/01 22:25	22.09	41.2
4/15/01 22:27	22.09	41.2
4/15/01 22:29	22.09	41.2
4/15/01 22:31	22.09	41.2
4/15/01 22:33	22.09	41.2
4/15/01 22:35	22.09	41.2
4/15/01 22:37	22.09	41.2
4/15/01 22:39	22.09	41.2
4/15/01 22:41	22.09	41.2
4/15/01 22:43	22.09	41.2
4/15/01 22:45	22.09	41.2
4/15/01 22:47	22.09	41.2
4/15/01 22:49	22.09	41.2
4/15/01 22:51	22.09	41.2
4/15/01 22:53	22.09	41.2
4/15/01 22:55	22.09	41.7
4/15/01 22:57	22.09	41.2
4/15/01 22:59	22.09	41.2
4/15/01 23:01	22.09	41.2
4/15/01 23:03	22.09	41.2
4/15/01 23:05	22.09	41.2
4/15/01 23:07	22.09	41.2
4/15/01 23:09	22.09	41.2
4/15/01 23:11	22.09	41.2
4/15/01 23:13	22.09	41.2
4/15/01 23:15	22.09	41.2
4/15/01 23:17	22.09	41.2
4/15/01 23:19	22.09	41.2
4/15/01 23:21	22.09	41.2
4/15/01 23:23	22.09	41.2
4/15/01 23:25	22.09	41.2
4/15/01 23:27	22.09	41.2
4/15/01 23:29	22.09	41.2
4/15/01 23:31	22.09	41.2
4/15/01 23:33	22.09	41.2

Date And Time	Temperature (º C)	RH (%)
4/15/01 23:35	22.09	41.2
4/15/01 23:37	22.09	41.2
4/15/01 23:39	22.09	41.2
4/15/01 23:41	22.09	41.2
4/15/01 23:43	22.09	41.2
4/15/01 23:45	22.09	41.2
4/15/01 23:47	22.09	41.2
4/15/01 23:49	22.09	41.2
4/15/01 23:51	22.09	41.2
4/15/01 23:53	22.09	41.2
4/15/01 23:55	22.09	41.2
4/15/01 23:57	22.09	41.2
4/15/01 23:59	22.09	41.2

Appendix B

Chain of Custody

Field Demo Number	Company	Field Deployed	Field Returned	Received in Lab	Wear Cycle	Squad	Fire Team
1	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
2	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
3	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
4	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
5	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
6	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
7	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
8	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
9	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
10	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
11	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
12	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
13	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
14	SKC	4/9/01	4/12/01	17-Apr-01	CNTL		
15	Gore	4/2/01	4/2/01	17-Apr-01	CNTL		
16	Gore	4/3/01	4/9/01	12-Apr-01	1	3	1
17	Gore	4/3/01	4/9/01	12-Apr-01	1	3	2
18	Gore	4/3/01	4/9/01	12-Apr-01	1	2	3
19	Gore	4/3/01	4/9/01	12-Apr-01	1	2	3
20	Gore	4/3/01	4/9/01	12-Apr-01	1	1	1
21	Gore	4/3/01	4/9/01	12-Apr-01	1	1	2
22	Gore	4/3/01	4/9/01	12-Apr-01	1	1	1
23	Gore	4/3/01	4/9/01	12-Apr-01	1	3	1
24	Gore	4/3/01	4/9/01	12-Apr-01	1	3	NR
25	Gore	4/3/01	4/9/01	12-Apr-01	1	1	3
26	Gore	4/3/01	4/9/01	12-Apr-01	1	1	2
27	Gore	4/3/01	4/9/01	12-Apr-01	NR	NR	NR
28	Gore	4/3/01	4/9/01	12-Apr-01	1	1	1
29	Gore	4/3/01	4/9/01	12-Apr-01	1	3	3
30	Gore						
31	Gore	4/3/01	4/9/01	12-Apr-01	1	2	1
32	Gore	4/3/01	4/9/01	12-Apr-01	1	1	3
33	Gore	4/3/01	4/9/01	12-Apr-01	1	1	3
34	Gore	4/3/01	4/9/01	12-Apr-01	1	2	1
35	Gore	4/3/01	4/9/01	12-Apr-01	1	3	3
36	Gore	4/3/01	4/9/01	12-Apr-01	1	3	3
37	Gore	4/3/01	4/9/01	12-Apr-01	1	2	2
38	Gore	4/3/01	4/9/01	12-Apr-01	1	2	1
39	Gore	4/3/01	4/9/01	12-Apr-01	1	1	2
40	Gore	4/3/01	4/9/01	12-Apr-01	1	NR	NR
41	Gore	4/3/01	4/9/01	12-Apr-01	1	3	3
42	Gore						
43	Gore						
44	Gore	4/3/01	4/9/01	12-Apr-01	NR	NR	NR
45	Gore	4/3/01	4/9/01	12-Apr-01	1	NR	NR
46	Gore	4/3/01	4/9/01	12-Apr-01	1	3	2
47	Gore						
48	Gore						

Field Demo Number	Company	Field Deployed	Field Returned	Received in Lab	Wear Cycle	Squad	Fire Team
49	Gore						
50	Gore						
51	Gore	4/10/01	4/12/01	13-Apr-01	3	1	2
52	Gore	4/10/01	4/12/01	13-Apr-01	3	2	1
53	Gore	4/10/01	4/12/01	13-Apr-01	3	2	1
54	Gore	4/10/01	4/12/01	13-Apr-01	3	1	3
55	Gore	4/10/01	4/12/01	13-Apr-01	3	1	3
56	Gore	4/10/01	4/12/01	13-Apr-01	3	1	3
57	Gore	4/10/01	4/12/01	13-Apr-01	3	2	2
58	Gore	4/10/01	4/12/01	13-Apr-01	3	2	3
59	Gore	4/10/01	4/12/01	13-Apr-01	3	2	3
60	Gore	4/10/01	4/12/01	13-Apr-01	3	2	3
61	Gore	4/10/01	4/12/01	13-Apr-01	NR	NR	NR
62	Gore	4/10/01	4/12/01	13-Apr-01	NR	NR	NR
63	Gore	4/10/01	4/12/01		NR	NR	NR
64	Gore	4/10/01	4/12/01	13-Apr-01	3	NR	NR
65	Gore	4/10/01	4/12/01		NR	NR	NR
66	Gore	4/10/01	4/12/01	13-Apr-01	3	1	NR
67	Gore	4/10/01	4/12/01	13-Apr-01	3	1	1
68	Gore	4/10/01	4/12/01	13-Apr-01	3	1	2
69	Gore	4/10/01	4/12/01	13-Apr-01	3	2	NR
70	Gore	4/10/01	4/12/01	13-Apr-01	3	2	1
71	Gore	4/10/01	4/12/01	13-Apr-01	3	2	2
72	Gore	4/10/01	4/12/01	13-Apr-01	3	2	2
73	Gore	4/10/01	4/12/01	13-Apr-01	3	1	2
74	Gore	4/10/01	4/12/01	13-Apr-01	3	1	1
75	Gore	4/10/01	4/12/01	13-Apr-01	3	1	1
76	Gore	4/10/01	4/12/01	13-Apr-01	3	3	2
77	Gore	4/10/01	4/12/01	13-Apr-01	3	3	1
78	Gore	4/10/01	4/12/01	13-Apr-01	3	3	NR
79	Gore	4/10/01	4/12/01	13-Apr-01	3	2	3
80	Gore	4/10/01	4/12/01	13-Apr-01	3	1	3
81	Gore	4/10/01	4/12/01	13-Apr-01	3	3	1
82	Gore	4/10/01	4/12/01	13-Apr-01	3	3	2
83	Gore	4/10/01	4/12/01	13-Apr-01	3	3	2
84	Gore	4/10/01	4/12/01	13-Apr-01	3	3	1
85	Gore	4/10/01	4/12/01	13-Apr-01	3	3	3
86	Gore	4/10/01	4/12/01	13-Apr-01	3	3	1
87	Gore						
88	Gore						
89	Gore						
90	Gore						
91	Gore						
92	Gore						
93	Gore						
94	Gore			13-Apr-01	3	3	3
95	Gore	4/10/01	4/12/01				
96	Gore	4/10/01	4/12/01	13-Apr-01	3	3	3
97	Gore	4/9/01	4/10/01	12-Apr-01	NR	NR	NR

Field Demo Number	Company	Field Deployed	Field Returned	Received in Lab	Wear Cycle	Squad	Fire Team
98	Gore	4/9/01	4/10/01	12-Apr-01	2	NR	NR
99	Gore	4/9/01	4/10/01	12-Apr-01	2	NR	NR
100	Gore	4/9/01	4/10/01	12-Apr-01	NR	NR	NR
101	Gore	4/9/01	4/10/01	12-Apr-01	2	3	3
102	Gore	4/9/01	4/10/01	12-Apr-01	2	3	3
103	Gore	4/9/01	4/10/01	12-Apr-01	2	3	1
104	Gore	4/9/01	4/10/01	12-Apr-01	2	3	1
105	Gore	4/9/01	4/10/01	12-Apr-01	2	2	1
106	Gore	4/9/01	4/10/01	12-Apr-01	2	2	2
107	Gore	4/9/01	4/10/01	12-Apr-01	2	2	3
108	Gore	4/9/01	4/10/01	12-Apr-01	2	3	2
109	Gore	4/9/01	4/10/01	12-Apr-01	2	2	3
110	Gore	4/9/01	4/10/01	12-Apr-01	2	3	3
111	Gore	4/9/01	4/10/01	12-Apr-01	NR	NR	NR
112	Gore	4/9/01	4/10/01	12-Apr-01	NR	NR	NR
113	Gore	4/9/01	4/10/01	12-Apr-01	2	1	NR
114	Gore	4/9/01	4/10/01	12-Apr-01	2	2	2
115	Gore	4/9/01	4/10/01	12-Apr-01	2	1	1
116	Gore	4/9/01	4/10/01	12-Apr-01	2	1	2
117	Gore	4/9/01	4/10/01	12-Apr-01	2	1	1
118	Gore	4/9/01	4/10/01	12-Apr-01	2	1	1
119	Gore	4/9/01	4/10/01	12-Apr-01	2	1	2
120	Gore	4/9/01	4/10/01	12-Apr-01	2	1	2
121	Gore	4/9/01	4/10/01	12-Apr-01	2	1	3
122	Gore	4/9/01	4/10/01	12-Apr-01	2	2	NR
123	Gore	4/9/01	4/10/01	12-Apr-01	2	1	3
124	Gore	4/9/01	4/10/01	12-Apr-01	2	1	3
125	Gore	4/9/01	4/10/01	12-Apr-01	2	1	3
126	Gore	4/9/01	4/10/01	12-Apr-01	2	2	1
127	Gore	4/9/01	4/10/01	12-Apr-01	2	2	1
128	Gore	4/9/01	4/10/01	12-Apr-01	2	2	3
129	Gore						
130	Gore	4/9/01	4/10/01	12-Apr-01	2	2	2
131	Gore	4/9/01	4/12/01	12-Apr-01	2	2	2
132	Gore	4/9/01	4/10/01	12-Apr-01	2	2	3
133	Gore	4/9/01	4/10/01	12-Apr-01	2	3	NR
134	Gore	4/9/01	4/10/01	12-Apr-01	2	3	1
135	Gore	4/9/01	4/10/01	12-Apr-01	2	3	1
136	Gore	4/9/01	4/10/01	12-Apr-01	2	3	2
137	Gore	4/9/01	4/10/01	12-Apr-01	2	3	2
138	Gore						
139	Gore	4/9/01	4/10/01	12-Apr-01	2	3	3
140	Gore	4/10/01	4/12/01	13-Apr-01	3	NR	NR
141	Gore						
142	Gore	4/10/01	4/12/01	13-Apr-01	3	3	3
143	Gore						
144	Gore						
145	Gore						
146	Gore						

Field Demo Number	Company	Field Deployed	Field Returned	Received in Lab	Wear Cycle	Squad	Fire Team
147	Gore						
148	Gore						
149	Gore						
150	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
151	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
152	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
153	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
154	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
155	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
156	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
157	Gore						
158	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
159	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
160	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
161	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
162	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
163	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
164	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
165	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
166	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
167	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
168	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
169	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
170	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
171	Gore	4/9/01	4/10/01	17-Apr-01	CNTL		
172	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
173	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
174	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
175	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
176	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
177	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
178	Gore	4/10/01	4/12/01	17-Apr-01	CNTL		
179	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
180	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
181	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
182	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
183	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
184	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
185	Gore	4/9/01	4/12/01	17-Apr-01	CNTL		
186	Gore				CNTL		
187	Gore	4/3/01	4/9/01	12-Apr-01	NR	NR	NR
188	Gore	4/3/01	4/9/01	12-Apr-01	1	2	3
189	Gore	4/3/01	4/9/01	12-Apr-01	NR	NR	NR
190	Gore	4/3/01	4/9/01	12-Apr-01	1	3	1
191	Gore	4/3/01	4/9/01	12-Apr-01	1	2	3
192	Gore						
193	Gore	4/3/01	4/9/01	12-Apr-01	1	1	3
194	Gore	4/3/01	4/9/01	12-Apr-01	1	2	2
195	Gore	4/3/01	4/9/01	12-Apr-01	1	2	2

Field Demo Number	Company	Field Deployed	Field Returned	Received in Lab	Wear Cycle	Squad	Fire Team
196	Gore	4/3/01	4/9/01	12-Apr-01			
197	Gore						
198	Gore	4/3/01	4/9/01	12-Apr-01	1	3	2
199	Gore	4/3/01	4/9/01	12-Apr-01	1	2	3
200	Gore	4/3/01	4/9/01	12-Apr-01	1	1	NR

Appendix E
Field Test Report Amphibious Assault Ship Iwo Jima

Final Report

On

Force Medical Protection Advanced Concept Technology Demonstration

Amphibious Assault Ship Iwo Jima (LHD 7) August, 2001

To

US Marine Corps System Command (MARCORSYSCOM)

October, 2001

By

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ABBREVIATIONS/ACRONYMS

ACTD	*Advanced Concept Technology Demonstration*
ASAP	*As soon as possible*
ATD-400	*A thermal desorption device that is manufactured by Perkin-Elmer Corporation*
CA	*Chemical agent*
CB	*Chemical-biological (usually modifies the word agent)*
COTS	*Commercial Off-the-Shelf*
CBIS	*Chemical Biological Individual Sampler*
DMN	*Dimethyl naphthalene*
DOD	*Dodecane*
EBEN	*Ethylbenzene*
FMP	*Force Medical Protection*
GC	*Gas chromatograph*
GD	*Chemical agent Soman (Pinacolyl methyl phosphonofluoridate)*
IPCS	*Individual Passive Chemical Sampler*
IDLH	*Immediately dangerous to life and health*
JHU/APL	*Johns Hopkins University Applied Physics Laboratory*
LFPM	*Linear feet per minute*
LIM	*Limonene*
MARCORSYSCOM	*Marine Corps Systems Command*
MES	*Methyl Salicylate (Oil of Wintergreen), a common chemical simulant for HD*
LIM	*Limonene*
MIBK	*Methyl isobutyl ketone*
MSD	*Mass Selective Detector; an Agilent Corporation Mass Spectrometer specifically designed for use as a GC detector.*
NEPMU-2	*U.S. Navy Environmental and Preventive Medicine Unit 2*
NOSTD	*No standard (also commonly called a tentatively identified compound, or TIC)*
ORI	*Operational Readiness Inspection*
P-E	*Perkin-Elmer Corporation*
PPE	*Personal Protective Equipment (e.g. respirator, suit, boots, and gloves)*
RH	*Relative humidity, percent*
SKC	*SKC Corporation*
SOP	*Standard Operating Procedure*
TCA	*Trichloroethane*
TIC	*Toxic Industrial Chemical*
TMB	*Trimethyl Benzene*
TRI	*Tridecane*
TWA	*Time-weighted average (maximum allowed concentration for unprotected full-shift occupational exposure)*

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1.0 INTRODUCTION

Currently a true integrated Nuclear - Biological - Chemical (NBC) defense and force health protection system that is designed to sample low levels of chemical agent (CA) exposure does not exist. These low levels are below those that would cause immediate symptoms, and are below the levels of detection of the CA detectors currently used in the field. In addition these CA detectors generally do not respond to toxic industrial chemicals (TIC), which also are a threat to the health of the warfighter. The force medical protection community lacks the means to measure and record the individual warfighter's exposure to low levels of chemical and biological (CB) agent or TICs. This information is crucial to assess the risk to individuals to continued low-level exposure and to diagnose near and long term health monitoring and treatment programs.

The Force Medical Protection ACTD addresses this need by evaluating the presence and/or absence of CB agents or selected TICs using a chemical-biological individual sampler. The CBIS system will provide non-intrusive capability to measure sub-clinical exposures to these toxic materials and provide exposure data for health surveillance.

1.1 BACKGROUND

Initial CBIS activities are designed around the use of commercial Individual Passive Chemical Sampler (IPCS). The samplers are generally constructed as small, wearable badges that contain Tenax, which is a commonly used wide-spectrum absorbent for air-borne organic materials that has a demonstrated capability to capture CA vapors (RK Smith et al, Final Report On CB Individual Sampler Testing, MARCORSYSCOM, August 2000).

The environment of the warfighter is, bluntly stated, chemically dirty. In addition to normal environmental contaminants like dust, there are vehicle fumes, fuel vapors, gases from fired weapons, and miscellaneous materials like smoke obscurants. In addition to military contaminates, there are harmful environmental contaminants like pesticides, polychlorinated biphenyls and toxic industrial chemicals.

The strategy for prior testing was to conduct laboratory testing for the ability of Commercial-Off-The-Shelf (COTS) samplers to collect detectable amounts of chemical agent at

the TWA and the IDLH. This testing was performed at the Battelle HMRC in early 2000 and was documented in the above-referenced report.

Two prior field tests were conducted. The first was conducted by placing the IPCS on warfighters with special armbands and placing samplers pre-doped with a chemical agent simulant on a test board with a temperature and RH data logger. This test was done in the field at Fort A.P. Hill Field Exercise Area on November 14 - 16, 2000, and provided limited data due to large losses of samplers from warfighters during the test. The chemicals detected during these tests were benzene, tetrachloroethene, ethyl-benzene, limonene, undecane, and trimethyl-benzene. Another chemical found in the SKC samplers only was N,N-dimethylacetamide, which is thought to be a breakdown product of the SKC case.

The second test was done by McKenna MOUT Facility Fort Benning, Georgia 9-13 April 2001. The data from this Fort Benning, GA exercise showed similar compounds to the first test, but also showed that methyl salicylate, the pre-exposure doping material, was present after wearing on most of the badges. This was not surprising due to its presence in many materials with varying uses such as breath mints and foot powder.

This third test was done during the initial cruise aboard the amphibious assault ship Iwo Jima (LHD 7) on 20-30 August 2001. LHDs embark, transport, deploy, command and fully support an expeditionary unit of 2,000 Marines. These samplers were deployed as area samplers rather than personal samplers, which from an industrial hygiene standpoint lessens the information due to these samples not being able to be correlated to the work regimen of an individual. However, the sampler is exposed full-time in a known position during its use allowing an evaluation of vapors present in the ship compartments.

2.0 OBJECTIVES

The objectives for this effort with the IPCS were:

- Demonstrate the ability of the IPCS to function in a shipboard environment. This included trying to assess the IPCS' ability to absorb chemicals of interest when contaminated with shipboard environmental chemicals;
- Determine what environmental chemicals could be collected by the course of wear on shipboard. Although these samplers were not worn, the chemicals collected and

concentrations are expected to be similar to the findings if samplers were worn by individuals in each of these compartments.

- Provide passive sampler data for comparison by others with active sampling. Active (pumped) sampling was performed or 8-hour periods by NEPMU-2 personnel in the same compartments.
- Compare results between 2-3 laboratories familiar with analysis of these types of chemicals using similar mass spectrometers but with three different thermal desorber units: a Perkin-Elmer ATD-400 at Battelle's Hazardous Materials Research Center (HMRC) in West Jefferson, OH; a Perkin-Elmer Turbomatrix® at the Occupational Safety and Health Administration's Salt Lake City, UT laboratory (OSHA-SLC); and a Gerstol unit at the US Army's Center for Health Promotion and Preventative Medicine (USACHPPM) at Aberdeen Proving Ground, MD. Each laboratory received samplers from each shipboard location.

3.0 TEST STRATEGY

This test was conducted as part of an overall test conducted by Johns Hopkins University/Applied Physics Laboratory (JHU/APL) and the U.S. Navy Environmental and Preventive Medicine Unit 2 (NEPMU-2). NEPMU-2 and JHU/APL provided sampler deployment and data logging.

Two types of passive samplers (Gore and SKC; the samplers are described in Section 3.1 below) were deployed in 5 compartments of the LHD in the exercise. The samplers were deployed for 8 hours, 1 day, and 7 days. In addition, one low-flow variant of the SKC sampler was deployed in two of the compartments for 7 days each. A temperature and RH data logger (HOBO) was operated in each compartment during sampling. No Battelle representative was present during sampling; NEPMU-2 and JHU/APL personnel deployed samplers and data loggers during ship movement. The planned duration of deployment is shown for each group of samplers in Table 3-1. Part of the badges went to OSHA-SLC, and part of the badges went to USACHPPM so that laboratory comparability could be initially evaluated.

In addition to the deployed samplers, field blanks in each area were prepared to allow determination of the contamination that may occur during shipment and storage before laboratory analysis. The field blank samplers were opened in the sampling location and was then immediately closed.

The deployed badges and blanks were then split up and sent to the respective laboratories. Table 3-1 lists the non-blank badges deployed in this test and the laboratories to which they were sent.

Table 3-1: Summary Of IPCS Planned Deployment Locations

Location	**Duration**	**Number of Gore Samplers (Battelle)**	**Number of Gore Samplers (OSHA-SLC)**	**Number of Gore Samplers (USA-CHPPM)**	**Number of SKC Samplers (Battelle)**
Oil test lab	8 hour	3	1	1	3
Oil test lab	24 hour	3	1	1	3
Oil test lab	7 day	3	1	1	3
Oil test lab	Blank	1	1	1	1
Well Deck	8 hour	3	1	1	3
Well Deck	24 hour	3	1	1	3
Well Deck	7 day	3	1	1	3
Well Deck	Blank	1	1	1	1
JP5 Pumping room	8 hour	3	1	1	3
JP5 Pumping room	24 hour	3	1	1	3
JP5 Pumping room	7 day	3	1	1	3
JP-5 Pumping Room	Blank	1	1	1	1
Signal Bridge	8 hour	3	1	1	3
Signal Bridge	24 hour	3	1	1	3
Signal Bridge	7 day	3	1	1	3
Signal Bridge	Blank	1	1	1	1
Engine Room	8 hour	3	1	1	3
Engine Room	24 hour	3	1	1	3
Engine Room	7 day	3	1	1	3
Engine Room	Blank	1	1	1	1
SKC Specials					
Signal Bridge	7 day				3
Oil test lab	Blank				1
Well Deck	7 day				3
Oil test lab	Blank				1
Post Exposures	--------				6
Oil test lab	Blank				1

3.1 DESCRIPTION OF SAMPLERS

The samplers used were supplied by W.L. Gore and SKC Corporation. They are similar to those evaluated earlier for CA adsorption performance and are currently under evaluation for agent and TIC collection capability.

The Gore samplers used in this test (Figure 3-1 below) are composed of two small Tenax-containing packets (often referred to as pillows) inside a larger, olive-drab permeable envelope with a white impermeable backing. To analyze the sorber, one of the two pillows are removed and placed in empty thermal desorption tubes. These sorbers are referred to as the "new GoreSorbers®" in this report and other IPCS reports because the outer package has been modified from the configuration that was originally tested against chemical agent in late 1999 and early 2000.

Figure 3-1 New GoreSorbers®

There are also two sampler designs from the SKC Corporation. This sampler has a permeable front plate in an impermeable Nylon® case. The sorbent is loaded behind the permeable front plate and is sealed in place by a rear plate. To analyze the badge, a plug is removed from the back of the badge and the sorbent is transferred into a sorbent tube. A slightly different badge design was tested against chemical agent in 1999 than was used in this test. The SKC badge is shown in Figure 3-2 below.

The SKC badge was deployed in two configurations; one configuration had the normal face that controls flow at about 10-15 mL/minute apparent velocity. A second, low flow version was also deployed that has an estimated apparent velocity at 4-8 mL/minute.

Figure 3-2 SKC Sampler – Front and Back Views

3.2 TEST PHASE

GoreSorbers®, SKC samplers (normal flow) and SKC samplers ("slow" flow) were designated as test units in the ship. The badges were packaged and shipped to the Iwo Jima port of embarkation without opening vendor packaging. The badges were then hung by NEPMU-2 and JHU/APL representatives in each of five areas (Signal Bridge, Well Deck, JP-5 Pump Room, Engine Room, and Oil Test Laboratory) to look at the range of contaminants expected. Samplers were placed on a board to represent a potential sampling area and for ease of handling. The samplers were exposed for varying amounts of time (8-hour, 24-hour, and 7-day periods) with a temperature and RH data logger nearby. The samplers were then closed according to manufacturer procedures and put aside for laboratory analysis. Three field blank samplers for each Gore and normal flow SKC sampler were opened and then immediately re-closed.

Except for part of the "slow" SKC samplers, the badges are analyzed after use, but are not deliberately exposed to chemicals in the laboratory. At each of the laboratories, each sampler is analyzed by thermal desorption coupled with gas chromatography/mass spectrometry. At Battelle, the analysis was done using an ATD-400 coupled with an Agilent (Hewlett-Packard) 6890 GC with an Agilent 5873 mass selective detector (MSD). By plan, each laboratory analyzed one of the 7-day samplers to determine what chemicals were present and identified. This allowed each laboratory to provide input to the chemicals list to be sampled. A common analyte list was then prepared.

Each laboratory was then to obtain the standards that could be obtained for each of the chemicals within two working days and begin analysis of the samplers. Each laboratory was then to prepare a separate report.

A group of the "slow" SKCs were exposed to MES after field deployment as a demonstration of how well the badges would collect target analytes after being contaminated with battlefield chemicals. Post-exposure dosing of the samplers was to be done with MES

vapor at Battelle only. Dosing in this manner required that the samplers be exposed to a moving air stream of at least 20 linear feet per minute (20 LFPM).

A carousel arrangement was to be used for post-exposure sampling. In this system, a sampler is mounted on the central carousel with its face pointed along the radius of the circle so that air is moved tangentially across the sampler face. The carousel is rotated to give a velocity of at least 20 LFPM across the face. Air is moved through the 30-liter volume system at a flow rate of at least 10 liters/minute so that the chemical mixture in the system is replenished.

3.3 Analytical Method

All sample preparation activities were designed to put the sorbent or its contents into a tube so that thermal desorption could be done. Specifically, analysis of the samplers was done on an ATD-400® thermal desorber coupled to an Agilent 6890 GC/5973 MSD (the MSD is equipped with a turbo pump).

Initial sample analysis was conducted with the ATD desorbing at 275 ^{o}C for 10 minutes, desorbing to the focusing trap held at 10 ^{o}C. The focusing trap was then desorbed for 15 minutes at 300 ^{o}C. A low temperature cycle (starting at 10 ^{o}C and ramping to 280 ^{o}C and hold until a total of 1 hour) was used on the GC, and the mass spectrometer was operated from 35 to 400 AMU's. One 7-day sampler from each area and up to 2 blanks were analyzed by each laboratory under similar conditions. After analysis of these samples, a conference call was held to discuss results. Using these results new conditions were selected. These conditions of operation are summarized in Table 3-2.

Table 3-2: ATD-400/GC/MSD Conditions

Parameter	Value
ATD-400	
Tube (Pillow) Desorption Time	5-10 minutes
Desorption Temperature	280 ^{o}C
Focusing Tube Adsorption Temperature	10 ^{o}C
Focusing Tube Desorption Temperature	300 ^{o}C
Focusing Tube Desorption Time	15 minutes
GC	
Column	Restek® RTX-5, 30 m x 0.25 mm i.d. Film thickness 0.25 micron
Gas Flow	24 psi; constant pressure mode

Parameter	Value
Temperature Program	10 ºC Hold 5 minutes Ramp 10 ^{o}C/min to 180 ^{o}C Ramp 50 ºC/minute 280 ºC Hold 1 minute
MSD	
Mass Spectrometer	Electron Ionization Scanning between 45 and 350 amu

4.0 RESULTS

4.1 DEPLOYMENT ACTIVITY REPORT

Samplers were shipped to JHU/APL for testing. Deployment activities were not monitored by Battelle. The JHU/APL deployment report is provided in Appendix A. Temperatures and relative humidity for each of the seven HOBO data loggers are provided in Figures 4-1 through Figure 4-7. Data that appear out of range on the charts are due to download errors and loss of digits during download. These data do not represent actual changes in conditions.

Sampling points for Battelle-analyzed samplers are identified in Table 4-1. Locations and sampling durations are provided in Table 3-1 for the items analyzed by OSHA and USACHPPM.

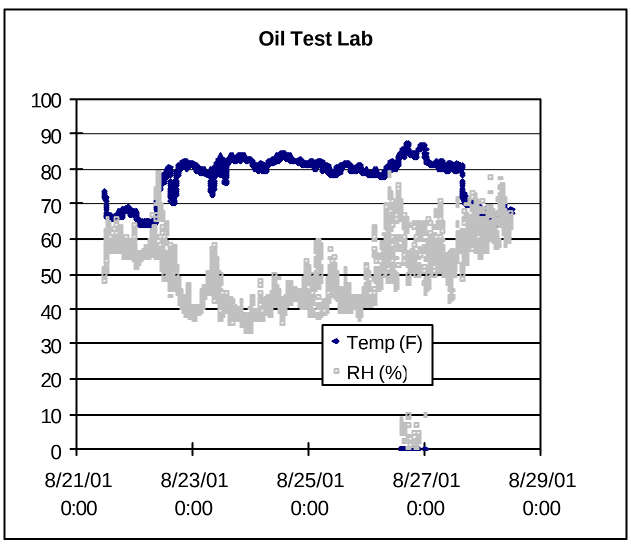


Figure 4-1. Oil Test Lab Temperature and Relative Humidity

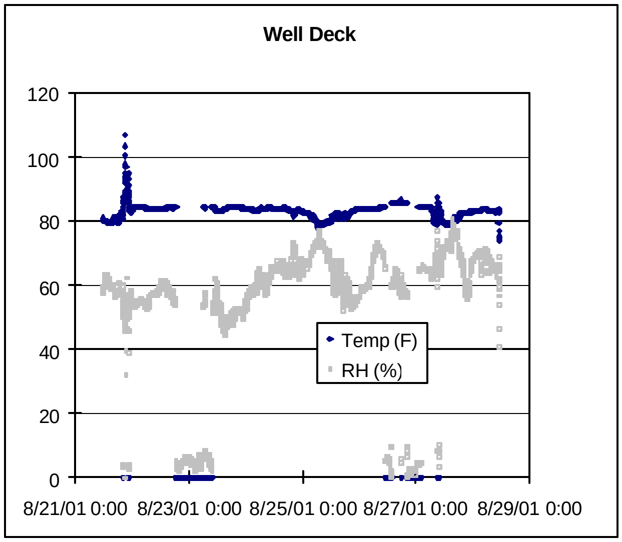


Figure 4-2. Well Deck Temperature and Relative Humidity

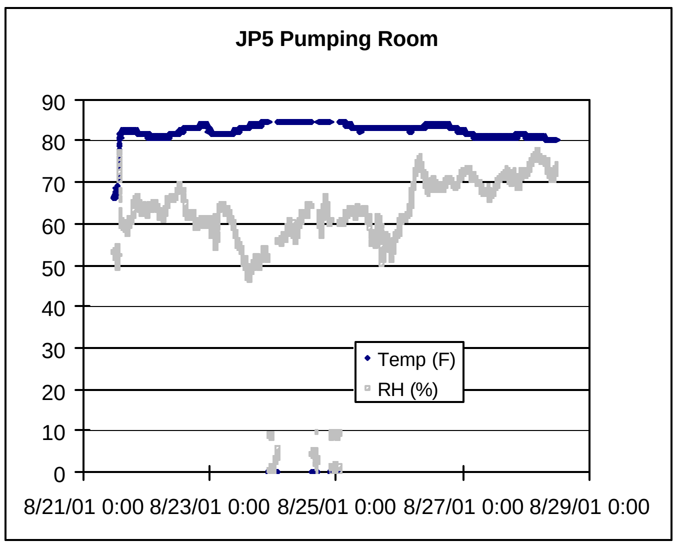


Figure 4-3. JP5 Pumping Room Temperature and Relative Humidity

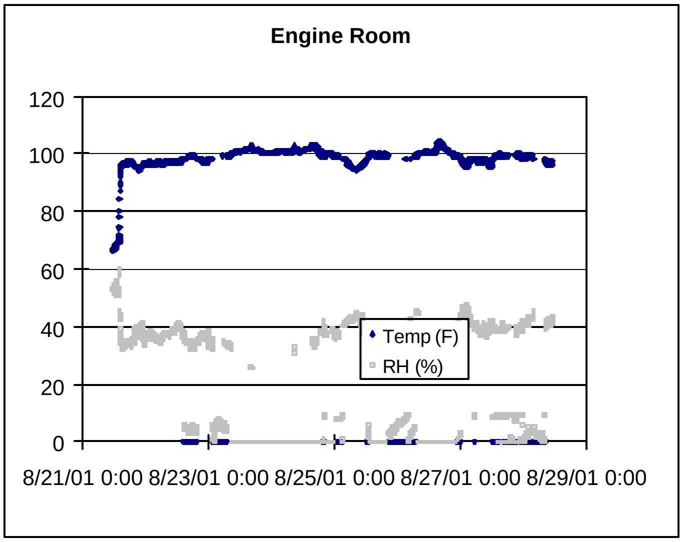


Figure 4-4. Engine Room Temperature and Relative Humidity

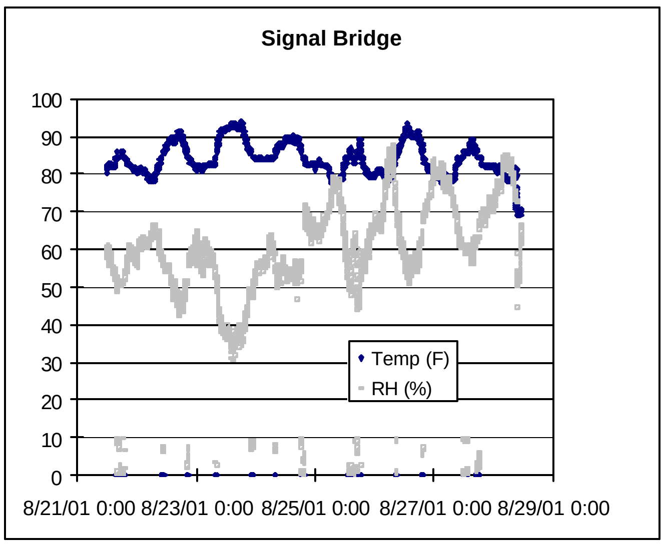


Figure 4-5. Signal Bridge Temperature and Relative Humidity

Table 4-1: Summary Of IPCS Deployment Locations for Samplers

Location	Duration	Sampling Dates and Times	Gore Sampler Numbers (Battelle)	Gore Sampler Numbers (OSHA-SLC)	Gore Sampler Numbers (USA-CHPPM)	SKC Sampler Numbers (Battelle)	SKC Sampler Numbers (OSHA-SLC)	SKC Sampler Numbers (USA-CHPPM)
Oil test lab	8 hour	Start - 8/23, 0734 Stop - 8/23, 1535	7,8,9	4	1	7,8,9	4	1
Oil test lab	24 hour	Start - 8/23, 0742 Stop - 8/24, 0800	10,11,12	5	2	10,11,12	5	2
Oil test lab	7 day	Start - 8/21, 1125 Stop - 8/28, 1125	13,14,15	6	3	13,14,15	6	3
Oil test lab	Blank							
Well Deck	8 hour	start - 8/21, 1615 stop - 8/21, 2350	22,23,24	19	16	22,23,24	19	16
Well Deck	24 hour	start - 8/21, 1050 stop - 8/22, 1053	25,26,27	20	17	25,26,27	20	17
Well Deck	7 day	start - 8/21, 1050 stop - 8/28, 1050	28,29,30	21	18	28,29,30	21	18
Well Deck	Blank							
JP5 Pumping Room	8 hour	start - 8/24, 0734 stop - 8/24, 1534	37,38,39	34	31	37,38,39	34	31

Location	Duration	Sampling Dates and Times	Gore Sampler Numbers (Battelle)	Gore Sampler Numbers (OSHA-SLC)	Gore Sampler Numbers (USA-CHPPM)	SKC Sampler Numbers (Battelle)	SKC Sampler Numbers (OSHA-SLC)	SKC Sampler Numbers (USA-CHPPM)
JP5 Pumping Room	24 hour	start - 8/24, 0727 stop - 8/25, 0810	40,41,42	35	32	40,41,42	35	32
JP5 Pumping Room	7 day	start - 8/21, 1340 stop - 8/28, 1330	43,44,45	36	33	43,44,45	36	33
JP5 Pumping Room	Blank							
Signal Bridge	8 hour	start - 8/22, 1230 stop - 8/22, 2030	52,53,54	49	46	52,53,54	49	46
Signal Bridge	24 hour	start - 8/21, 0900 stop - 8/22, 1110	55,56,57	50	47	55,56,57	50	47
Signal Bridge	7 day	start - 8/21, 0900 stop - 8/28, 0900	58,59,60	51	48	58,59,60	51	48
Signal Bridge	Blank							
Engine Room	8 hour	start - 8/24, 0810 stop - 8/24, 1612	67,68,69	64	61	67,68,69	64	61
Engine Room	24 hour	start - 8/23, 1815 stop - 8/24, 1830	70,71,72	65	62	71,72	65	62

Location	Duration	Sampling Dates and Times	Gore Sampler Numbers (Battelle)	Gore Sampler Numbers (OSHA-SLC)	Gore Sampler Numbers (USA-CHPPM)	SKC Sampler Numbers (Battelle)	SKC Sampler Numbers (OSHA-SLC)	SKC Sampler Numbers (USA-CHPPM)
Engine Room	24 hour	start - 8/24, 0815 stop – 8/25, 0815 (assumed)				70		
Engine Room	7 day	start - 8/21, 1430 stop - 8/28, 1440	73,74,75	66	63	73,74,75	66	63
Engine Room	Blank							
SKC Specials							**SKC Specials**	**SKC Specials**
Signal Bridge	7 day	start - 8/21, 0900 stop - 8/28, 0900				76-88, Blank		
Well Deck	7 day	start - 8/21, 1050 stop - 8/28, 1050				89-101, Blank		

4.2 INITIAL ANALYSIS OF 7-DAY SAMPLERS

As described above in Section 3.2, one each of the seven-day samplers was analyzed to determine the compounds of interest. The compounds identified in each of the samplers that Battelle analyzed are listed in Table 4-2. An example of the data that were obtained for one sampler is provided in Appendix C. Stacked chromatograms of the SKC 7-day samplers and the Gore 7-day samplers are provided in Figure 4-6 and 4-7 respectively. Note that these are very complex chromatograms in the 14-23 minute range. Each peak shown on the chromatograph represents one compound; there are many compounds on each sampler. Battelle, OSHA, and USACHPPM each analyzed one 7-day sampler from each area and determined likely chemicals

of industrial hygiene significance that were present on the samplers. A conference call was conducted to determine the common set of chemicals that the three laboratories would report.

The set of reference compounds that was selected represent those of likely IH concern for the IPCS samplers. They are:

- Ethylbenzene
- 1,1,2,2-tetrachloroethane
- Limonene
- Dodecane
- Undecane
- Tridecane
- Trimethyl benzene
- Dimethyl naphthalene
- Nonanal, and methyl isobutyl ketone.

Each laboratory agreed to obtain the standards that were available within two days, and then to begin analysis. Because the standards for one trimethyl benzene isomer, dimethyl naphthalene isomers, and nonanal were not available at Battelle in time to analyze samples, these compounds were quantified by adding a known amount of a deuterated internal standard (D8 toluene). In the chromatogram of each sampler, the measured relative abundance of these three chemicals were divided by the relative abundance of the internal standard and then multiplied by the known amount of the deuterated standard. These compounds are shown in the figures and tables with the label NOSTD. This designation was used in lieu of the EPA more common nomenclature of tentatively identified compound or TIC because the TIC abbreviation is already used for Toxic Industrial Compounds in this program.

TABLE 4-2. COMPOUNDS IDENTIFIED DURING INITIAL ANALYSIS OF 7-DAY SAMPLERS

Location	1,1,2,2-Trichloroethane	Substituted Benzenes	Undecane	Dodecane	Tridecane	1,2,3 Trimethyl Benzene	Substituted naphthalene	Nonanal	Branched Chain Hydrocarbons	Xylenes
Engine Room	X	X	X	X				X		
Signal Bridge	X	X	X	X				X		
Pump Room		X					X		X	
Well Deck		X					X		X	
Oil Test Lab		X	X						X	X

Several chemicals in Table 4-3 are simply categories of chemicals. Many chemicals could represent that category. Representative chemicals were chosen for each of the categories from the tentatively identified compound list from analysis of the 7-day samplers. For example, dodecane and tridecane are representative of the straight chain hydrocarbons and are significant from an industrial hygiene perspective. The trimethyl benzene and dimethyl naphthalene were chosen as potential compounds. Because each isomer of trimethyl benzene shows up separately on the scans, these were treated separately.

File : E:\!SKC7DAY\IWOJ209.D
Operator : THD
Acquired : 19 Sep 2001 6:25 pm using AcqMethod CBISIWO
Instrument : Orange
Sample Name: SKC 59
Misc Info :
Vial Number: 7

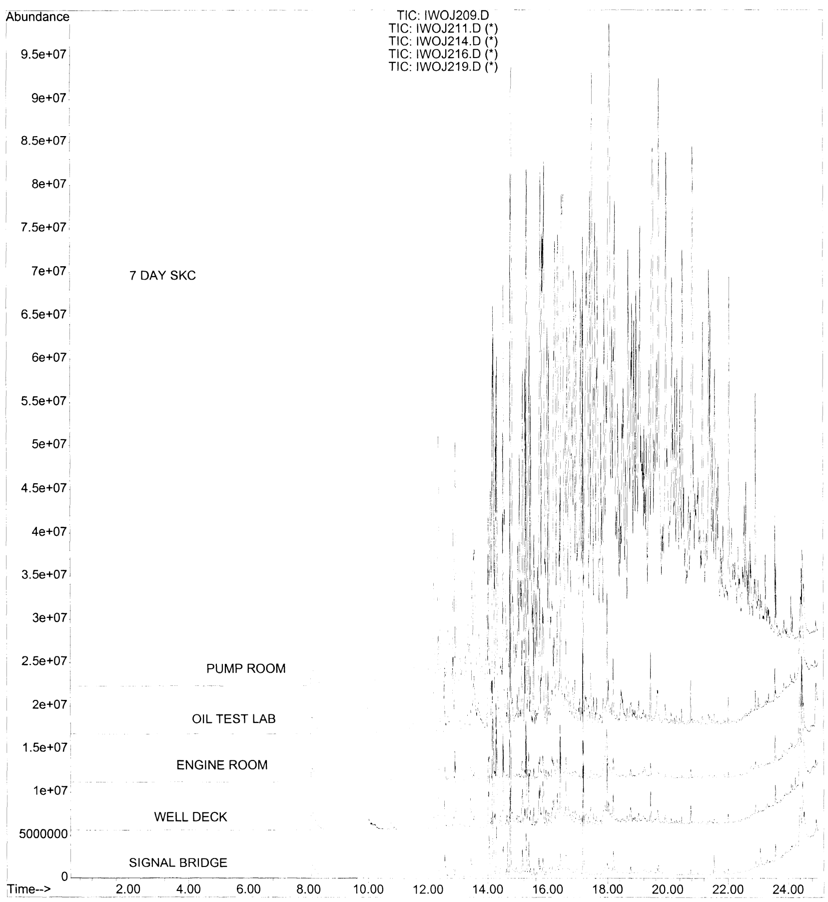


Figure 4-6 Stacked Chromatograms Showing SKC 7-Day Sampler Data

```
File       : E:\!GORE7DAY\IWOJ129.D
Operator   : FRM
Acquired   : 14 Sep 2001   3:45 pm using AcqMethod CBISIWO
Instrument :   Orange
Sample Name: GORE 59
Misc Info  :
Vial Number: 8
```

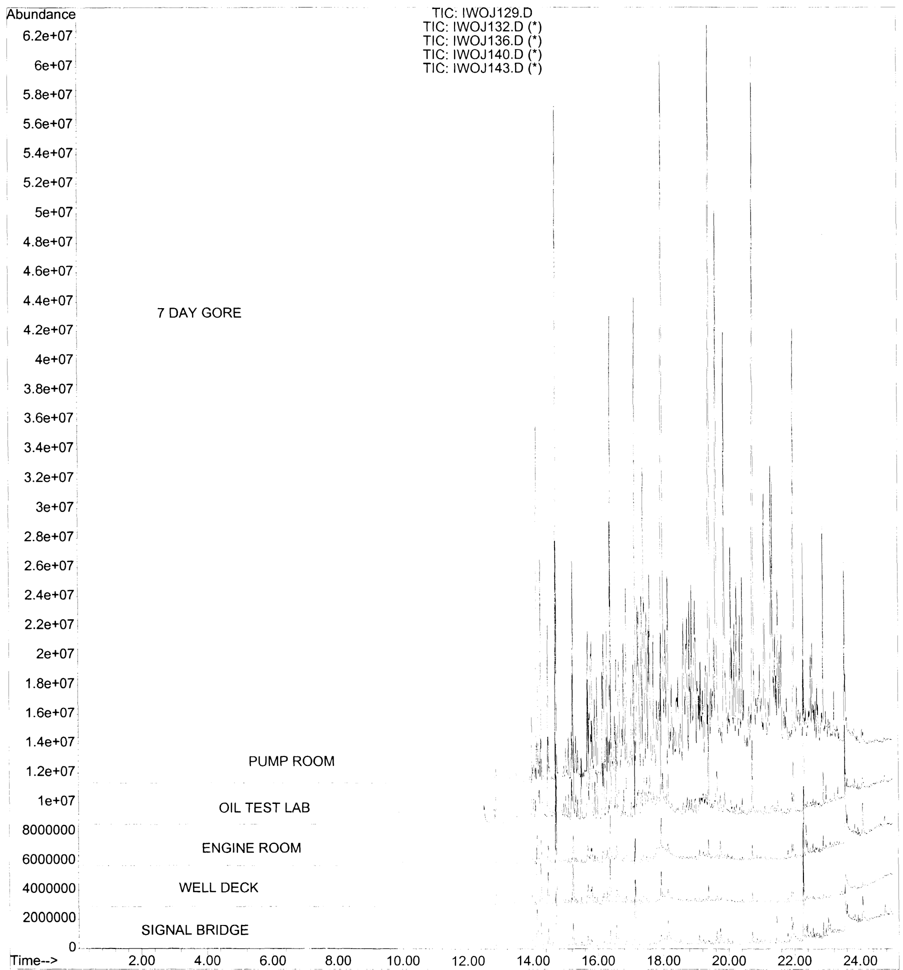


Figure 4-7. Stacked Chromatogram Showing 7-Day Gore Data

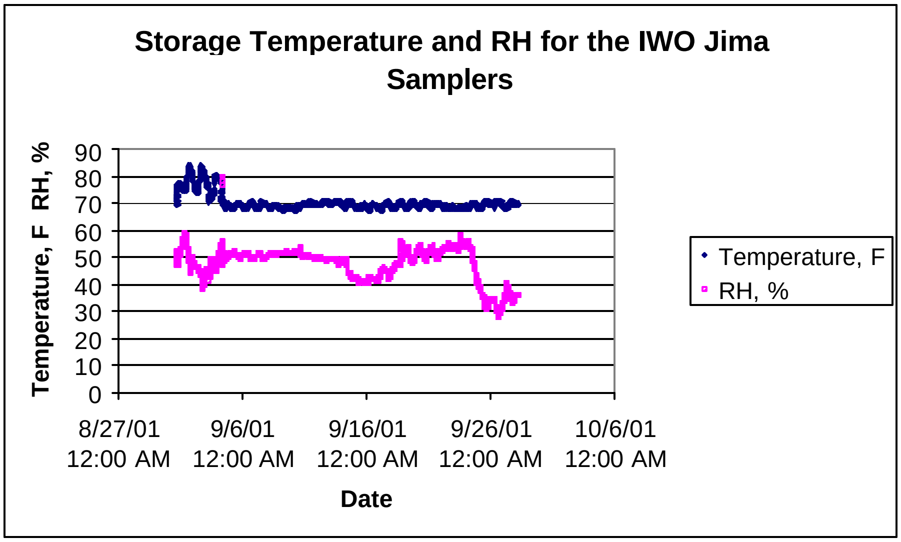


Figure 4-8 Temperature and Relative Humidity for the Sample Storage Duration

4.3 DATA FROM SAMPLER ANALYSIS

The data contained in Appendix B show the results of analysis of each sampler that was received for each of the hydrocarbons that were selected to be quantfied. In this table, only two of each of the SKC 7-day samplers is reported, because one of the 7-day SKC and Gore samplers from each area was used for the initial analysis. Because each GoreSorber® contains two pillows, the second pillow in each 7-day sampler was used for quantification so that all three samplers were quantitatively evaluated.

The results in Appendix C show the data base screen on one sampler; this shows how the GC-MS results can have multiple interpretations for the same sample. In order to interpret these results rapidly to determine the actual chemicals found, skilled industrial hygienists, chemists, and operators are required. These results indicate several thousand compounds must be considered, and most discarded, to select the compounds to be quantified.

5.0 Discussion of Results

The summarized results are provided in Table 5-2 and Figure 5-1 for the Gore samplers and Table 5-3, Table 5-4, and Figure 5-2 for the SKC samplers. The headings on the columns are abbreviated to reduce the width of the table. The explanation of each abbreviation is provided in the “Abbreviations” section of this report and is also provided as a legend in the figures. For the compounds that Battelle did not have a standard available, these compounds are shown as NOSTD in the table. For these compounds, the compound is not definitely present and the quantity is not compared as it is with a chemical for which Battelle had standards. On these chemicals, the mass spectrum was compared to the NIST database and the compound was selected based upon the match and its likelihood of being present. The abundance was compared to the internal standard and used to estimate the chemical concentration.

The blank results for the samplers are shown in Table 5-1. This data shows that the SKC samplers, on a per-sampler basis, had much more contamination on it than the Gore. However, the background on the GoreSorbers® appears much more variable than the background on the SKC’s. Further, because the SKC sampler has about 250 mg of sorbent vs 40 mg per Gore pillow, the GoreSorber® has 4.5 ng/mg of sorbent (about half of this is limonene) vs. 2.5 ng/mg of sorbent in the SKC. Gore’s clean-up process is proprietary, so Battelle cannot comment on this further. SKC has indicated that their cleanup process is a thermal desorption process, and that the Tenax in these samplers was treated to only 240 C instead of 280 C that is used for desorption in the ATD. Their technical people have indicated that this material can be cleaned up more by thermal desorption.

Table 5-1. Blank Sampler Data

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3 NOSTD ng	Nonanal NOSTD ng	DMN NOSTD ng
Gore												
SIGNAL BRIDGE BLK	3	1	0	0	1	99	0	17	0	0	11	9
WELL DECK BLANK	3	2	0	0	0	96	6	18	29	0	35	16
ENGINE ROOM BLANK	3	2	0	0	0	94	0	0	0	0	0	0
OIL TEST LAB BLANK	4	2	10	0	0	97	7	22	0	0	0	53
PUMP ROOM	3	6	0	9	29	91	69	49	26	31	0	0

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3 NOSTD ng	Nonanal NOSTD ng	DMN NOSTD ng
ROOM BLANK												
Mean	3	3	2	2	6	95	16	21	11	6	9	16
Std Dev	0.4	2.0	4.3	4.1	12.6	3.1	29.5	17.7	15.1	13.8	15.2	22.0
RSD	12.0%	71.5%	223.6%	211.2%	210.5%	3.3%	179.8%	83.4%	137.1%	223.6%	163.6%	140.8%
SKC												
SIGNAL BRIDGE BLK	165	19	0	28	95	89	65	68	11	48	133	39
WELL DECK BLANK	139	11	0	19	65	76	55	60	12	101	87	40
ENGINE ROOM BLANK	148	11	0	18	62	50	51	37	8	88	66	41
OIL TEST LAB BLANK	155	12	0	23	75	74	0	44	8	121	48	20
PUMP ROOM BLANK	138	12	0	13	46	71	51	45	14	77	55	23
Mean	149	13	0	20	69	72	45	51	11	87	78	33
Std Dev	11	3	0	5	18	14	26	13	3	27	34	10
RSD	7.6%	25.8%		26.8%	26.6%	19.7%	57.3%	25.0%	24.2%	31.4%	44.1%	31.1%
Gore contaminant/ mg sorbent	0.08	0.07	0.05	0.05	0.15	2.39	0.41	0.53	0.27	0.15	0.23	0.39
SKC contaminant/ mg sorbent	0.60	0.05	0.00	0.08	0.28	0.29	0.18	0.20	0.04	0.35	0.31	0.13

For virtually all cases for the SKC sampler, the 7-day collection quantity appears to be much more than 21 times the 8-hour collection quantity or 7 times the 24-hour collection quantity. This may indicate either a much larger end-of-cruise loading for all compounds, or it could indicate a non-linear loading rate and a secondary effect such as an initial low and then a later higher variable face velocity across the sampler.

However, for the Gore samplers, the 8 and 24 hour samplers seem to be somewhat in line, but the adsorption of the 7-day sample appears to be much more variable than the other two samplers. Again, this may indicate end-of-cruise loading, but may also indicate other effects.

Except for the Oil Test Lab, all 7-day Gore samplers have a zero result for MIBK and several others show a zero result for compounds such as nonanal and dimethyl naphthalene. The SKC results seem to be more consistent, that if the 8-hour sample and the 24-hour sample show a result, then the 7-day result also shows a result larger than either of the other two. This may indicate that the SKC sampler tends to hold the chemical (prevent reverse diffusion or some

other phenomena such as chemical breakdown) better than the Gore sampler. This conclusion also will require experimental verification.

The low-flow SKC samples are listed in Table 5-4. These data indicate several points; first, much of the field blank background (about 50% of it) results from field blank exposure and handling. The first set of data (samplers A-H) are blank samplers that were post-spiked with MES in the Battelle chamber. The total "blank" quantity of the identified organics for the SKC samplers is 1.4 ng/mg vs 2.5 ng/mg for the exposed field blanks discussed previously. For the Signal Bridge samples, there appears to be a fairly strong correlation between the quantity captured on the low flow SKC badges and the normal flow SKC badges (Figure 5-4). This correlation shows the flow in the low flow SKC at about 40% of the regular SKC sampler. This is in line with expected results. No correlation was investigated for the Well Deck.

Badge analysis results indicate that there is methyl salicylate present in the sampled areas. Post-spike results show that there is still capacity to adsorb left, and that the adsorption of MES during post-exposure is very uniform which appears to indicate that the badges are still performing well after exposure.

Table 5-2. Summary of Gore Results

	Sampling Period	MIBK	EBEN	TCA, 1,1,2,2-	TMB, 1,3,5-	TMB, 1,2,4-	LIM	UND	DOD	TRI	TMB 1,2,3	Nonanal	DMN
Sample Name	hours	ng	Ng	Ng	ng	ng	ng	ng	ng	ng	ng NOSTD	ng NOSTD	ng NOSTD
Signal Bridge													
8-hour	8	-1	0	-2	5	22	-87	11	3	-3	40	218	-9
24-hour	24	63	-1	-2	7	29	-92	6	1	-2	19	364	-16
7-day	168	-3	2	-2	267	508	-95	182	74	74	179	264	-16
Well Deck													
8-hour	8	0	4	-2	27	78	-85	72	65	64	42	161	65
24-hour	24	4	17	-2	116	252	-24	200	160	110	198	244	53
7-day	168	-3	13	-2	692	2394	-95	1322	1553	2300	493	333	97
Engine Room													
8-hour	8	-2	7	-2	59	94	-91	25	4	2	95	268	2
24-hour	24	-3	6	-2	76	174	-93	56	25	11	126	292	-16
7-day	168	-3	1	34	294	886	-95	1019	1182	1846	235	203	214
Oil Test Lab													
8-hour	8	5	12	-2	53	102	-47	93	61	55	99	89	23
24-hour	24	3	20	-2	99	245	-9	230	156	104	202	289	101
7-day	168	33	86	-2	2437	4898	-7	4403	4145	6593	2666	1050	782
Pump Room													
8-hour	8	2	37	-2	108	140	-52	415	350	369	242	-9	467
24-hour	24	-3	102	-2	345	386	-51	1062	921	874	688	558	2149
7-day	168	-3	23	11	441	1453	-13	7619	18614	48737	630	-9	10353

Note: All results are in nanograms (ng) with average field blank results subtracted. Negative results indicate that the blank contained more of the chemical than the analyzed sample.

Table 5-3. Summary of SKC Results

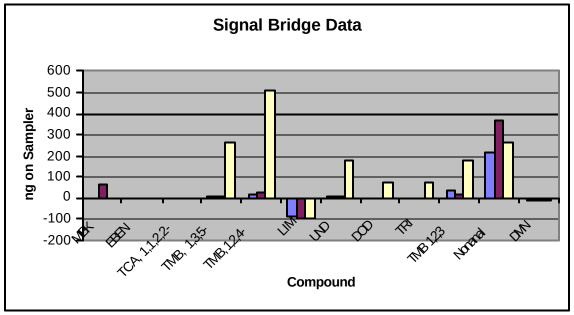
	Sampling Period	MIBK	EBEN	TCA, 1,1,2,2-	TMB, 1,3,5-	TMB, 1,2,4-	LIM	UND	DOD	TRI	TMB 1,2,3	Nonanal	DMN
Sample Name	hours	ng	Ng	ng	ng	ng	ng	ng	ng	ng	ng NOSTD	ng NOSTD	ng NOSTD
Signal Bridge													
8-hour	8	15	1	0	14	42	-8	34	8	1	37	6	29
24-hour	24	120	-1	0	7	29	-15	27	-6	3	19	54	29
7-day	168	203	55	0	755	1393	20	500	257	239	949	-78	-33
Well Deck													
8-hour	8	32	5	8	28	57	-3	115	39	48	61	3	30
24-hour	24	-17	32	0	168	325	-5	266	207	142	235	115	95
7-day	168	-28	173	0	1804	4440	122	2162	2110	2386	1965	71262	21389
Engine Room													
8-hour	8	6	10	0	69	79	-9	21	5	6	57	-36	24
24-hour	24	-32	16	0	113	232	3	93	36	19	241	95	13
7-day	168	-149	72	0	1155	3003	15	1470	1162	1205	1279	29967	13668
Oil Test Lab													
8-hour	8	-2	11	10	52	80	25	80	44	38	75	-19	14
24-hour	24	10	46	0	161	344	144	360	239	155	284	184	102
7-day	168	353	591	0	5997	6147	575	5711	4166	4584	5818	110069	45748
Pump Room													
8-hour	8	23	48	0	107	123	16	419	325	309	185	-78	653
24-hour	24	-29	296	0	504	521	33	1469	1061	986	695	-78	2271
7-day	168	-149	1430	470	7227	7700	482	26244	35681	61294	9523	-78	1628579

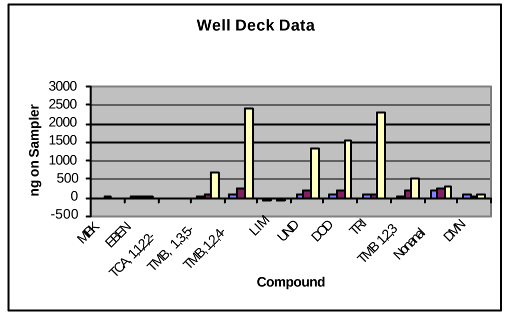
Note: All results are in nanograms (ng) with average field blank results subtracted. Negative results indicate that the blank contained more of the chemical than the analyzed sample.

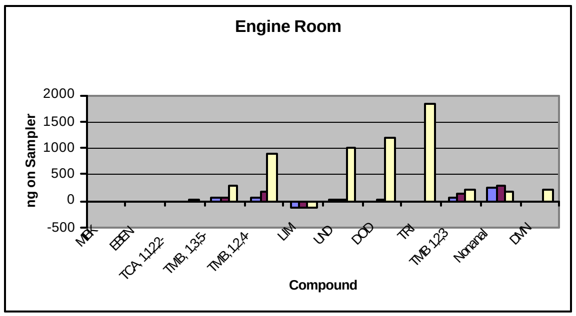
Table 5-4. Results for SKC Low Flow Samplers

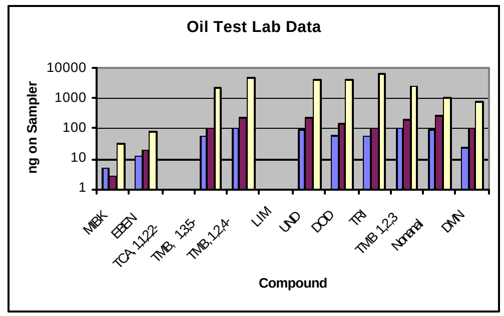
	MIBK ng	EBEN ng	TCA, 1,1,2,2 ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3- NOSTD ng	Non-anal NOSTD ng	DMN NOSTD ng	MeS ng
BLANK POST-SPIKE													
LF SKC H (MeS)	0	5	0	8	25	18	31	50	12	32	94	30	7
LF SKC A (MeS)	0	5	0	8	26	17	36	54	13	40	87	68	61
LF SKC C (MeS)	0	5	0	8	26	18	39	52	12	36	79	77	61
LF SKC B (MeS)	0	5	0	8	26	16	46	54	11	38	97	55	60
LF SKC D (MeS)	0	5	0	8	24	13	44	51	11	67	81	54	79
LF SKC E (MeS)	0	5	0	8	25	15	46	53	10	82	88	56	71
LF SKC F (MeS)	0	5	0	8	26	15	51	55	9	76	86	53	65
LF SKC G (MeS)	0	5	1	8	25	13	40	53	9	51	83	50	68
AVERAGE	0	5	0	8	25	15	43	53	11	56	86	59	66
% RSD		5%	247%	3%	3%	12%	15%	3%	14%	35%	7%	23%	33%
SIGNAL BRIDGE													
LF SKC 87 SIG BR	216	51	0	266	400	60	183	74	23	553	115	27	36
LF SKC 77 SIG BR	206	48	0	265	401	31	156	58	23	449	68	27	37
LF SKC 82 SIG BR	187	43	0	242	376	40	142	54	21	403	44	0	30
LF SKC 76 SIG BR	208	48	5	256	409	45	149	60	22	468	73	18	39
LF SKC 78 SIG BR	219	50	0	279	429	39	144	60	21	430	65	67	46
LF SKC 79 SIG BR	220	51	0	270	416	43	142	57	21	405	52	27	42
LF SKC 84 SIG BR	172	44	0	262	412	28	129	43	20	332	19	0	43
AVERAGE	204	48	1	263	406	41	149	58	22	434	62	24	39
% RSD	9%	6%	265%	4%	4%	25%	11%	16%	6%	16%	48%	95%	13%
SIGNAL BRIDGE POST SPIKE													
LF SKC 81 SIG BR PS	231	53	0	271	413	70	165	90	28	526	84	70	98
LF SKC 83 SIG BR PS	230	52	0	273	404	65	160	87	23	489	93	76	101
LF SKC 88 SIG BR PS	217	54	0	281	412	66	163	68	23	511	85	76	99
LF SKC 80 SIG BR PS	215	53	0	290	448	42	150	62	24	400	50	45	117

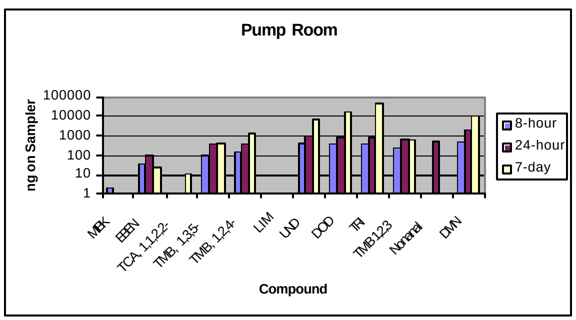
	MIBK ng	EBEN ng	TCA, 1,1,2,2 ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3- NOSTD ng	Non-anal NOSTD ng	DMN NOSTD ng	MeS ng
LF SKC 85 SIG BR PS	187	47	0	257	395	49	130	52	22	420	60	48	102
LF SKC 86 SIG BR PS	221	52	0	278	436	43	148	61	24	467	60	49	109
AVERAGE	217	52	0	275	418	56	153	70	24	469	72	61	104
% RSD	7%	4%		4%	5%	23%	8%	22%	9%	11%	24%	24%	7%
WELL DECK													
LF SKC 90 WELL DECK	103	82	0	464	660	59	398	274	163	593	17	86	32
LF SKC 92 WELL DECK	123	81	0	441	606	66	389	273	157	696	58	113	52
LF SKC 96 WELL DECK	111	82	0	450	653	69	394	267	158	661	25	135	33
LF SKC 99 WELL DECK	91	80	0	453	656	73	392	263	157	612	9	77	29
LF SKC 91 WELL DECK	113	82	0	447	604	69	405	273	158	759	54	92	92
LF SKC 95 WELL DECK	100	77	0	432	597	72	395	256	154	675	23	95	31
LF SKC 101 WELL DECK	112	80	0	443	614	84	399	268	157	722	51	134	28
AVERAGE	107	81	0	447	627	70	396	268	158	674	34	105	42
% RSD	10%	2%		2%	4%	11%	1%	2%	2%	9%	59%	22%	56%











MIBK=Methyl isobutyl ketone
EBEN=Ethyl benzene
TCA, 1,1,2,2-=1,1,2,2 Trichloroethane
TMB, 1,3,5-=1,3,5 Trimethyl benzene
TMB, 1,2,4-=1,2,4-Trimethyl benzene
LIM= Limonene
UND=Undecane
DOD=Dodecand
TRI=Tridecane
TMB 1,2,3-=1,2,3-Trimethyl benzene
Nonanal=Nonanal
DMN=Dimethyl naphthalene
MeS=Methyl salicylate

Figure 5-1. Consolidated Gore Results

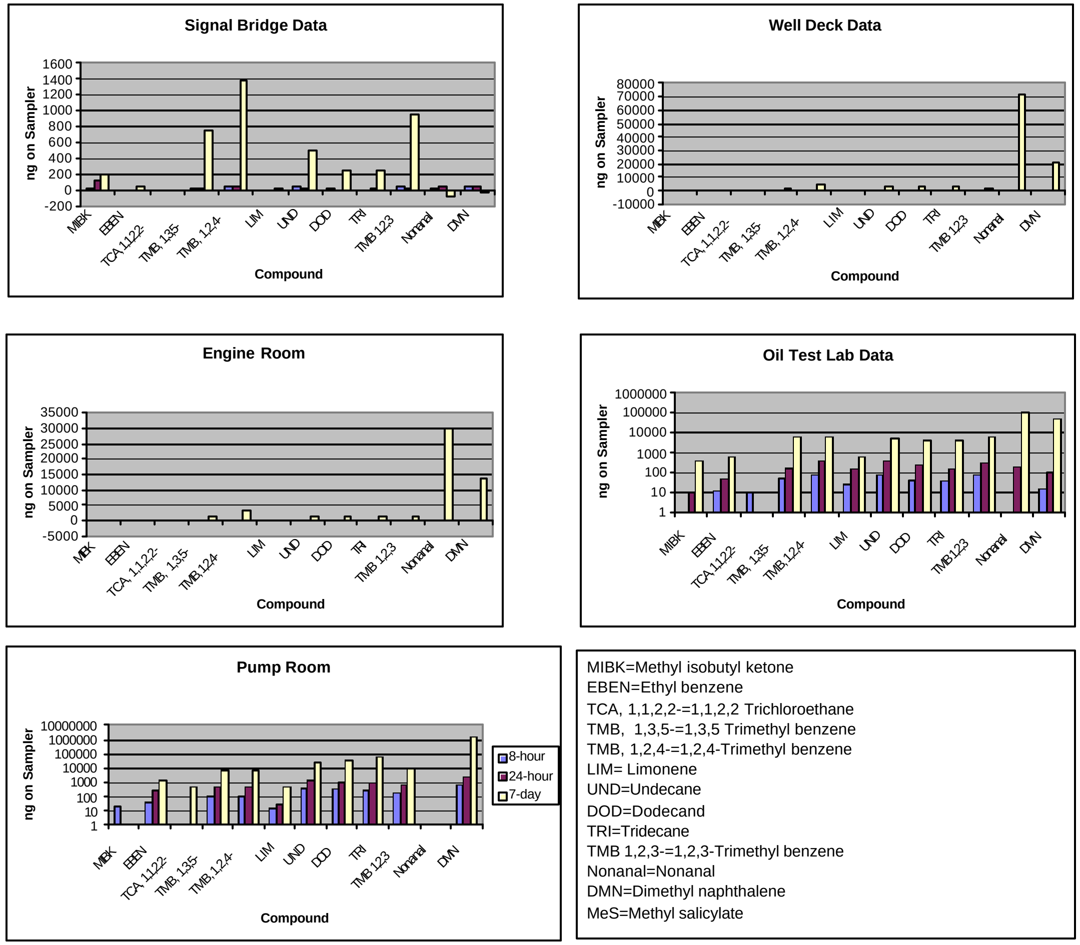


Figure 5-2. Consolidated SKC Results

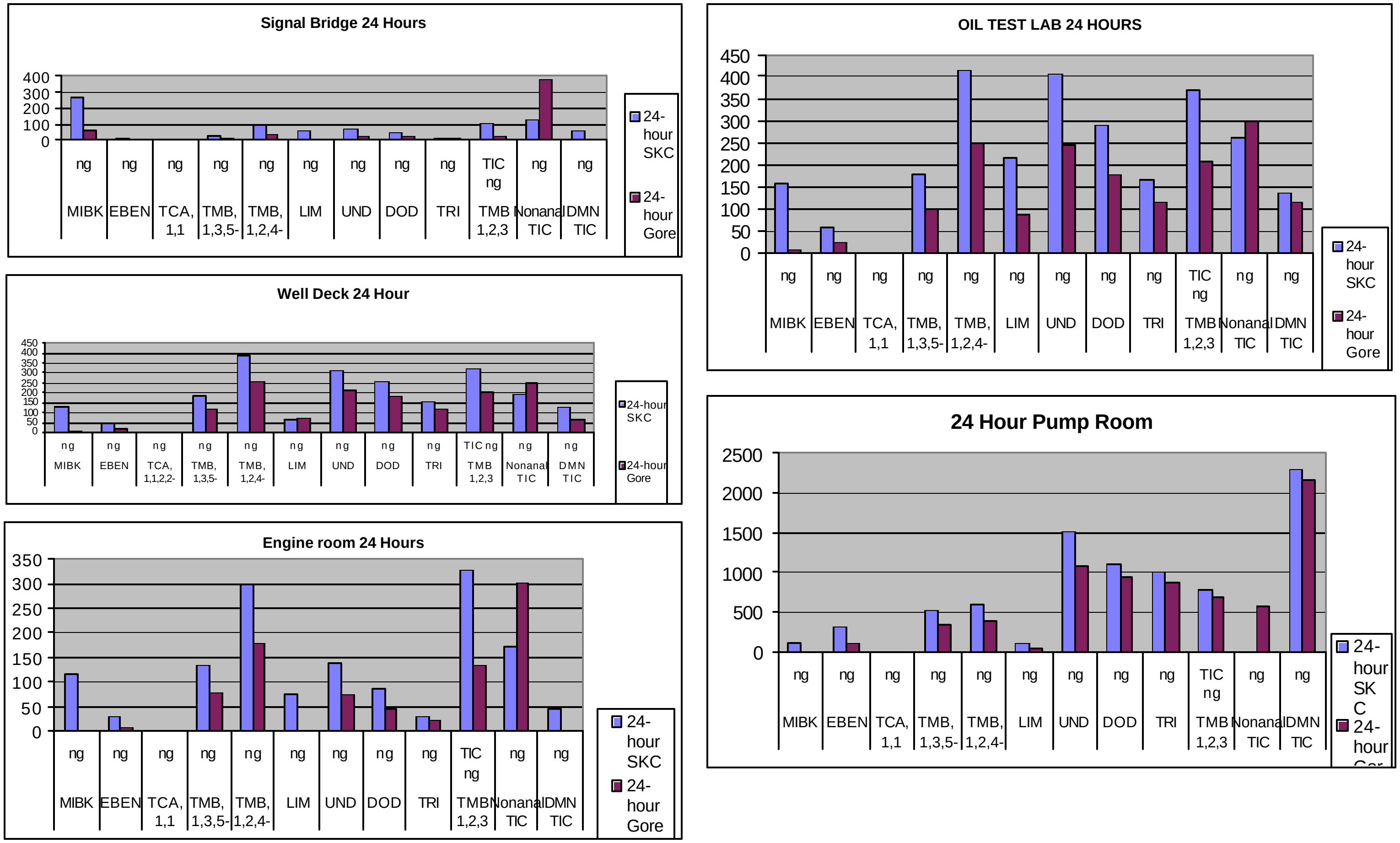


Figure 5-3. Comparison of the GoreSorbers® to the SKC Samplers for the 24-hour Sampling Period

Table 5-5. Total Loadings on SKC and Gore Samplers

	SKC (ng)	Gore (ng)
Signal Bridge		
8-hour	178	148
24-hour	267	329
7-day	4260	1385
Well Deck		
8-hour	422	442
24-hour	1563	1278
7-day	107785	9047
Engine Room		
8-hour	233	412
24-hour	828	601
7-day	52848	5765
Oil Test Lab		
8-hour	408	495
24-hour	2028	1389
7-day	189760	27036
Pump Room		
8-hour	2130	2017
24-hour	7728	6980
7-day	1778402	87807

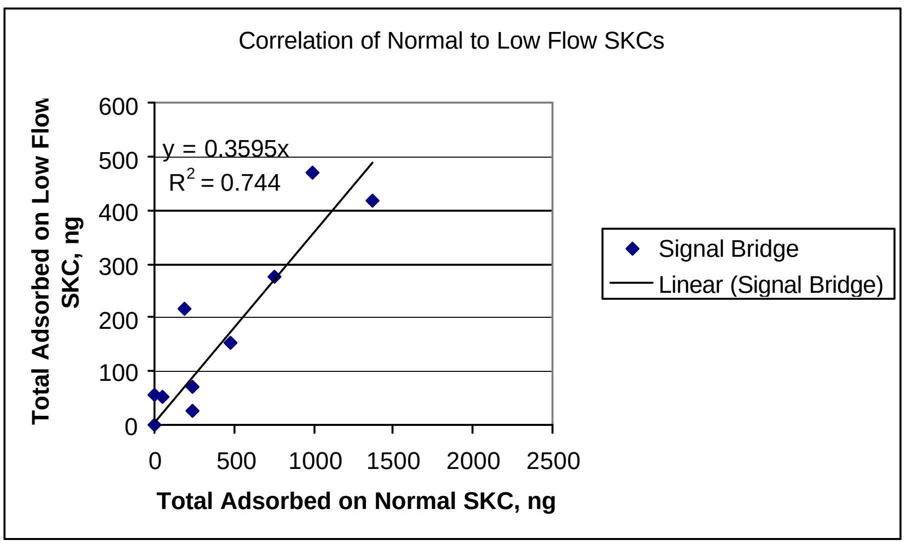


Figure 5-4. Correlation Between SKC Low Flow and SKC Normal Badges for the Signal Bridge Only

6.0 Conclusions and Recommendations

Samples were collected on the Iwo Jima during its first cruise using the IPCS COTS candidates. Non-post-spiked samples were collected in the August 21-August 28 timeframe and were analyzed within 14 days after shipment to the laboratory. Post spikes were spiked within 21 days after receipt and analyzed within 7 days of post-spike.

·If the total ng of chemical contamination in any one area is evaluated, the signal bridge is consistently the less contaminated area across sampling periods, and the pump room is consistently the dirtiest across sampling periods. This holds true for SKC and Gore samplers.

It is not valid to compare the absolute results of Gore vs SKC because they have different effective sampling rates and probably have different minimum face velocities. In comparing total ng collected on Gore vs SKC across chemicals, SKC consistently collects more ng for all sampling periods. This is predominantly due to the high baseline contamination for most chemicals present on the SKC sampler. SKC has indicated that they can do a higher temperature cleanup that should correct this problem. When the results are corrected for high blank quantities, then the SKC generally collects less in the first 8-hour period than the Gore sampler, about the same amount in the 24-hour period, and more in the 7-day period. The result in the 7-day period can be explained because the SKC sampler has over 6 times the amount of sorbent in one Gore pillow (250 mg vs. 40 mg) so more material can be collected in an SKC sampler. Because the SKC sampler is also expected to have a lower face velocity (based on the evaluation of chemical agent data done in prior testing, the GoreSorber® has about 3 times the collection rate of the SKC sampler) this could indicate that the GoreSorber® is reaching maximum sorption load early in the exposure cycle (possibly even before 24 hours).

For the 8-hour SKC samplers, the results for all chemicals in all sampling areas, except Pump Room, are not significantly different from blank especially when the standard deviation of the sample is considered. Due to the high background, this gives a high signal to noise ratio which is unsatisfactory. MIBK is especially high signal-to-noise across all sampling locations.

For the 8 hr GoreSorbers®, results of samples are different from blanks for more chemicals than for SKC. In general the Gore sampler seems to be more sensitive; and have a better signal to noise which makes it better for short-duration sampling. Limonene consistently shows 95 ng on the blank Gore sampler which may indicate a contamination problem in manufacturing.

The 24 hour Gore and SKC samplers were compared across all sampling areas. This sample duration was chosen for comparison because the high background limited sensitivity for the SKC

samplers at 8 hours and some of the large values for the 7 day samples on the SKC sampler that were not seen on the Gore sampler. A summary of the results is as follows:

- ·The two samplers show similar trends when comparing chemical amounts within an area. (See Figure 5-4).
- Amounts of chemicals relative to each other follow the same trends for the SKC and the Gore sampler. This supports that both samplers are functioning consistently across sampling areas in the shipboard environment.
- ·As stated previously, SKC consistently measures higher amounts of chemicals with the exception of nonanal. Gore consistently measures higher amounts for nonanal. There does not appear to be any nonanal in the blanks, which may account for SKC having a lower amount (e.g. it samples more slowly and does not start out with more on it).
- ·Both samplers consistently show zero results for TCA. This is the case across all sampling areas and times.
- ·The pump room clearly contains the highest amounts of contaminants.

The oil pump room and oil test lab were compared across 8 hour and 24 hour samplers because the samplers were started at the same time and date. The object was to look for proportional mass loading.

In the Oil Test room, 8 hour and 24 hour samples were started simultaneously. Results indicate the anticipated proportional mass loading of about 3:1 for the 24 hour versus 8 hour samples. SKC shows, on average across all the chemicals, a response of 3:1 (relative standard deviation 29%). Gore samples show an average of a 2:1 response (relative standard deviation 30%) for the 24 hr versus the 8 hour sampler. One possibility is that the Gore sampler is already becoming loaded.

The 7 day sample was begun prior to and extended after the 24 hour sampling period. It's more reasonable to compare 7 day to 24 due to concerns about signal to noise ratios in the 8 hour samples. When comparing 7 day mass loading to the 24 hour mass loading, the expected ratio of 7 to 1 is not found in either sampler. Observed mass ratios (using the sum of all mass adsorbed) are much higher than the anticipated 7:1 range. SKC's ratio of loading is at 82 (relative standard deviation %174) and Gore's ratio is at 16 (relative standard deviation of 94 %). Also see large variation in the ratio values across the samplers. It is difficult to speculate about the cause for variation in loading. Either the environmental concentrations were changing dramatically with

time(this can especially be expected if there are widely-varying operations occurring in the area) or the sampling rates were changing with time.

In the Pump Room, 8 hour and 24 hour samples were started simultaneously. Again, results indicate the anticipated proportional mass loading of about 3:1 for the 24 hour versus 8 hour samples. Note, if both the 8 and the 24 hour results indicated zero, the number was excluded from the average. Data again demonstrates a reasonable mass to time proportional loading. The 7 day sample was begun prior to and extended after the 24 hour sampling period. Again, when comparing 7 day mass loading to the 24 hour mass loading, the expected ratio of 7 to 1 is not found. The results indicate a ratio of 133:1 for SKC and 12:1 for Gore with extreme variability in the ratios across chemicals is found..

MIBK on the SKC, ethylbenzene on the Gore, and Nonanal on the Gore results indicated a lower 7 day result than the corresponding 24 hour results. This is of concern because the sampling periods overlapped so the 24-hour sample should have been at least as high. These results are suspect for this reason, and these values were not included in the average calculations provided above.

In Figure 5-4, the SKC low flow and normal flow sampler results were compared across all chemicals. These samplers generally agreed, with the low-flow sampler collecting approximately 35 percent of that collected by the normal-flow sampler for the same location.

Post-exposure spikes were done on several of the SKC low flow samplers. These were generally found to be in close agreement with each other, indicating that there is sufficient capacity on the samplers even after being heavily loaded to collect a representative amount of agent. The variability for the well-deck sampler is larger than that for the signal bridge; this could indicate that there is some blockage of the face or the adsorbing surface after sampling.

In summary, the 8-hour and 1-day results appear consistent on the badges within expected normal ratios. However, the 7-day samples generally show much more loading for the SKC samplers than the Gore samplers. These data also suggest that longer-term studies of loading need to be conducted on the samplers before an extended wear time is considered.

Appendix A

JHU Underway Notes

Force Medical Protection
Advanced Concept Technology Demonstration
USS Iwo Jima (LHD-7)
Demonstration Venue III
Underway Notes
20-30 August 2001

Date/Time	Event/Location	Issues/Misc.	Notes
20 Aug 1600 (Monday)	"IH Team" Onboard	Iwo Jima POCs LCDR Carlson (Safety) Chief Singleton PO Stubblefield PO Johnson?	LCDR Haissig LT Piotrowski LT Porter HM2 Yett HM2 Roach Web Smith
21 Aug (Tuesday)	Compartments: 1) **Well-Deck** 2) **Engine Room** (5-65-0-E) 3) **Oil Test Lab** (2-68-2-Q) 4) **Signal Bridge Shelter** (07-71-Q) (&Bio + **Medical**)) 5) **JP-5 Pump Room** (6-41-0-E)	No armbands/samplers were delivered. All exposed blanks and completed samples will be stored in refrigeration (medical).	Note that times on pictures are 1-hour early. Camera clock is fast. Note that flight deck is O-3 level.
0900-0910	**Signal Bridge Shelter** Mounted 7-Day Board & 24 Hour & 7-Day "Special" Board (SNs: 76-88)	Some SNs listed in Test Plan are incorrect. Boards and logs have correct/corrected SNs. Inside signal bridge rather than outside; concern for FODs.	Holes in board could have been larger to accommodate rope more easily. Mounting 24-hour was not planned (won't be aligned with 8-hour for signal bridge only)
0918	Signal Bridge Blanks		Plan to retrieve 24

Date/Time	Event/Location	Issues/Misc.	Notes
			Hour on Wed (8/22)
0925	Underway		
1045-1050	**Well-Deck** ~Frame 104 (2/3 from ramp) on Troop Walk Mounted 7-Day, 24-Hour, & 7-Day Special (SNs 89-101)		Plan to retrieve 24 Hour on Wed (8/22). LCAC Ops this evening from 1900-2300 Plan to conduct 8-hour (passive & active).
1100	Blanks/**Well-deck**		
1120	**Oil Test Lab** (x4614) 7-Day		
1130	Blanks/**Oil Test Lab**		
1340-1350)	**JP-5 Pump Room** 7-Day		
1350	**JP-5 Pump Room**/Blanks		
1430	**Engine Room**/7-Day and Blanks		
1500	MOB Drill		
1600	**Well-Deck/**Mounted 8-Hour and began active sampling (2 4-hr PE tubes plus 4x2 double glass 2-hour plus 2x2 double glass 4-hour) & Blanks (for active sampling)	Considered simultaneously conducting 8-hour test in well deck and signal bridge but too hard. Note that only provided with 4 PE Blanks (1 short for 5 compartments)!	“Glass Tube”/Sorbent Tube samplers are SKC “Coconut Charcoal, 20/40 mesh, 50/100 mg”-Catalog Number 226-01
1620	**Well-Deck**/8-Hour samplers in place		
1720	Well Deck: ventilation fans ON.		
1745	Noted one of the 2-hour glass (2A) tubes		No Ops, No Personnel

Date/Time	Event/Location	Issues/Misc.	Notes
	(2A) fell out. Estimated that it was last checked at 1720.		
1800	Swapped out first sets of 2-hour glass air sampler tubes.		
1806	Relocated from troop walk/**Well-deck** to forward of Well-deck proper.	Issue was FOD concern. If item is not bolted to bulkhead cannot be in well deck.	
1826	Completed relocation (pump were running, removed boards and Velcro and reattached just forward of well-deck.	Actually better location since this area has more personnel than troop walk (at least for LCAC Ops). "Upper V", about 60 feet forward from troop walk location.	
~1830	Ramp lowered		
1904	Pump check OK	Sampling near an air intake but required to be there because of FOD. Boards were OK.	
1913	LCAC approaching Ship (not entering though)		
1922	Pump check OK	HM2 Roach on alert for FOD watch.	
1930	LCAC enters well-deck	Nice breeze (forward to aft)	
1938	Materials (non FMP) flying.	FOD!	
1940	2nd LCAC enters		
1943	3rd LCAC enters	Fumes now very evident	
1955	Swapping out all (2-hr and 4-hr glass air	Very difficult with LCAC fans. No	

Date/Time	Event/Location	Issues/Misc.	Notes
	samplers)	IPCS were lost (FOD issue).	
2000	Burning eyes, heavy particulates, etc.		
2001	PE Tube swapped out	Pump Counter 169290	
2008	Glass tube blanks	Note that wetness during LCAC ops does not seem to be a major factor (although very humid); wind is main factor (FOD).	
2025	Attempted my 2-liter "grab" sample.	#02311 Blank #02319 Collect Tube: Failure, no power. Will need to charge battery.	
2030	LCAC exits		
2035	LCAC exits	Very hot air blast Extremely windy.	CO detector alarm went off!
2037	Last LCAC Engine On (off-cushion)		
2039	LCAC On-cushion	Extremely hot (& noxious) fumes.	
2042	LCAC exits		
2048	LCAC enters		
2049	LCAC exits		
2053	LCAC enters.		(2100 Bat in hangar!)
2104	LCAC exits.		
2112	LCAC enters.		
2120	LCAC exits.		
2128	LCAC enters.	Tiny amount of spray felt.	
2131	LCAC exits.		
2133	LCAC enters.		
2136	LCAC exits.		
2140	LCAC enters.		

Date/Time	Event/Location	Issues/Misc.	Notes
2142	LCAC exits.		
2143	LCAC enters.		
2144	LCAC exits.		
2145	LCAC enters.		
2146	LCAC exits.		
2150-2151	Swap 2-hour glass tube air samplers.		
2151	LCAC enters.		
2153	LCAC exits.		
2157	LCAC enters.		
2159	LCAC exits.		
2200	Ramp closing.		
2245	De-ballast Begins.		
2257	De-ballast Ends.		
2350	Pulling Tubes and Collecting IPCS 8-hour samples.		
22 Aug (Wednesday) 0800-1100	GQ…restricted to work space, must defer 24-hour IPCS collection		
1055-1058	**Well deck:** Collect 24-hour IPCS.		Pick up 7-day on Tuesday.
1110-1118	**Signal Bridge: (07-71-1-Q):** Collect 24-hour IPCS	[Signal Bridge Shelter] Limited ventilation, door open at all times.	
1230	Start 8-hour IPCS (Signal Bridge)	All board SNs were correct.	
1245	Start 2-hr/4-hr glass tube GT collection & PE tube		
1330	CH-46 Landing	Although the winds were away from the SB Shelter, some fumes were still noticeable.	
1350	CH-46 Take-off		

Date/Time	Event/Location	Issues/Misc.	Notes
1445	End 2-hr glass tube air sample		
1452	Complete-begin next 2-hr sample		
1500	CH-46 Landing		
1520	CH-46 Take-off		
1525	AV/8 Landing.		
1527	2nd AV/8 Landing		
1531	AV/8 Takeoff		
1534	AV/8 Takeoff		
1535	AV/8 Landing.		
1536	2nd AV/8 Landing		
1550	Signal Bridge Shelter Blank (APL)	Serial Number 00589	
1552	Commence **Signal Bridge Shelter** 2-liter air grab.	Serial Number 02280 (Start 0.765 liters)	
1554	AV/8 Takeoff		
1558	AV/8 Landing		
1602	AV/8 Takeoff		
1603	AV/8 Landing.		
1606	AV/8 Landing		
1607	AV/8 Takeoff		
1609	AV/8 Takeoff		
1611	AV/8 Landing		
1614	AV/8 Takeoff		
1616	AV/8 Landing.		
1622	AV/8 Takeoff		
1624	AV/8 Landing		
1632	2L Air Grab Complete	(2.765 Liters final)	
1635	CH-46 Landing		
1642	Glass Tube Blanks		
1643-1648	End 4-hr GT Air Sampling		
1649	Swap 4-hr PE Tube		
1700-1720	~4 take-offs (AV/8) Landings?		
1722	Begin another 2L	Serial Number	

Date/Time	Event/Location	Issues/Misc.	Notes
	(APL) Air Grab	02355 (2.765 Liters start)	
1723	AV/8 Landing (Spot 5; close)		
1727	AV/8 Takeoff		
1744	AV/8 Takeoff		AAV Ops Saturday LCAC Ops Monday
1800	CH-46 Landing		
1802	Ended 2L (APL) Air Grab	(4.76**9**L end)	
1818	CH-46 Takeoff.		
1819	CH-46 Landing		
1820	CH-46 Takeoff		
1822	CH-46 Landing		
1823	CH-46 Takeoff		
1830	CH-46 Landing		
1831	CH-46 Takeoff		
1833	CH-46 Landing		
1834	CH-46 Takeoff		
1835	CH-46 Landing		
1836	CH-46 Takeoff		
1838-1840	Swapped out 3rd 2-hour glass tube GT.	Meanwhile ~3 more CH-46 Landings/takeoffs	
1840-1918	Many more CH-46 landings/takeoffs		
1945	CH-46 Landing		
1958	CH-46 Takeoff		
2004	AV/8 Take-off (Did I miss landing?)		
2005	AV/8 Take-off (was parked)		
2009	AV/8 Take-off		
2014	AV/8 Landing		
2016	AV/8 Takeoff		
2020	AV/8 Landing		
2024	CH-46 Landing		
2030-2034	Collect Signal Bridge Shelter 8-hour IPCS		

Date/Time	Event/Location	Issues/Misc.	Notes
2040	Pull 8-hour glass tube and PE air samples.		
23 Aug (Thursday)	**Oil Test Lab** (2-68-2-Q)		
0734	Begin 8-hour IPCS (**Oil Test Lab**)		
0735	Setup 8-hr (2- & 4-hr glass tube & 4-hr PE) active sampling	Armbands/IPCS are "no go" on Flight Deck (Flight Ops) & Well-deck (LCAC Ops)	Need extra O-rinds. Easily to loose, hard to find…displaced from sample site.
0740	Commence Active Air Sampling		Note: Short on (FMP) PE tubes, no more PE tube blanks.
0742-0745	Begin 24-hour IPCS (**Oil Test Lab**)		[P/U 24-hr Fri@0730]
0833	Conduct 2L (APL) Active Air Grab "Near" IPCS board)	Serial Number 02287 Start 4769 mL	
0913	Complete Air Grab	End 6769 mL	
0940	2-hr glass tube active air sample swap out		
0945	Commence next 2-hr active air sampling.		
1129	Test in Progress ("Tested boiler water chemical limits alkalinity, phosphate, chloride" Prior To Light-off (PTL)		
1130	Conduct 2L (APL) Active Air Grab "Near" Testing Station (8 ft from IPCS board)	Serial Number 02365 Start 6769 mL	
1140	End 2nd 2-hr (1st 4-hr) active air glass and PE Tube GT sampling		

Date/Time	Event/Location	Issues/Misc.	Notes
1140	Begin 2nd 4-hr PE Tube sampling		
1145	~~Begin 2nd 4-hr (3rd 2-hr) Glass Tube Active Air Sampling~~	HOLD! Battery LOW/OUT.	
1202	Commenced Glass Tube (GT) Sampling. 2nd 4-hr (3rd 2-hr)	Swapped out battery/pump.	
1210	Completed 2nd 2L Active Air Grab (APL)	**End at 8769**	
1310	Completed Oil Lab MSDS Table		Send to C. McKay, A. Becker
1320	Chloride Test (Air Injection Drains)		
~1340	(Missed) MOB Drill		Last two to arrive at muster
1402	Swap-out 2-hr Glass Tube samplers		
1420	Ship/shore Phonecon W. Hendricks/OSHA	Blanks	No more PE blanks, not preconditioned.
1535	Collected 8-hr IPCS samplers (**Oil Test Lab**)		
1602	End/complete 8-hr active glass tube and PE sampling		
1810-1815	**Engine Room:** Compartment 5-65-0-E Put up 24-hr IPCS Samplers.		[P/U 24-Hr Fri@1810]
24 Aug (Friday)	**Engine Room & JP-5 Pump Room**		
0727	Begin IPCS 24-hr **JP-5 Pump Room**		
0734	Begin IPCS 8-hr **JP-5 Pump Room**		
0739	Active air sample	PE Tube pump start	

Date/Time	Event/Location	Issues/Misc.	Notes
	(GT) [Glass tubes (charcoal) & PE Tube (tenax) **JP-5 Pump Room**	900976	
0800	Collect IPCS 24-hr **Oil Test Lab**		
0810-0814	Begin IPCS 8-hr **Engine Room**		
0815	Remove cap from 24-hour SKC #70 (Battelle) (**Engine Room**)	Inadvertently left cap on this one (this one only).	#70 will be ~10 hour sample
0818	Begin 8-hr active air sampling (glass tube and PE) **Engine Room**	PE tube pump start 454375	
0823	Begin 2L air grab (APL) **Engine Room**	**Ser. No. 19424 Start at 8.769L**	
0843	**Engine Room**; notable increase in engine speed (volume, pitch, vibration)		
0848	Air Grab	Loss of decimal place when over 10 L.	
0851	**Engine Room**, Air Collect (Glass tubes) Tube #2, A1 found on floor "2-A1-2HR"	Suspect was out since ~0843	
0903	Completed 2L (APL) Air Grab (**Engine Room**)	Final 10.77L	Stole LT P pen
0918-0921	2-hr swap (glass tubes GT) **Engine Room**		
0935	Begin 2L (APL) Air Grab **JP-5 Pump Room**	Ser. No. 00672 Broke my glass tube for air sample storage (will cannibalize).	
0939-0944	2-hr swap out **JP-5**		

Date/Time	Event/Location	Issues/Misc.	Notes
	Pump Room		
1015	**Completed 2L (APL) Air Grab** **JP-5 Pump Room**	12.77L final	
1031	Begin 2L (APL) Air Grab **Engine Room**	**Ser. No. 00968 Start 12.77L**	Returned LT P pen.
1052	Noticeable slowing of engines		
1111	Completed 2L air grab (**Engine Room**)		
1134	Start 2L (APL) Air Grab (**JP-5 Pump Room**)	**Start at 14.77L Ser. No. 02302**	
1138	Blanks (glass tube) (**JP-5 Pump Room**)		
1139	Remove 4-hr air sampler (**JP-5 Pump Room**) (glass vial)		
1143	Start 4-hr air sampler (glass vial) JP-5 Pump Room		
1144	Remove (2nd) 2-hr glass vial. (**JP-5 Pump Room**)		
1148	Start (3rd) 2-hr glass vial air sampling. (**JP-5 Pump Room**)		
1150	Swap PE Tube (Active Air GT Sampling) (**JP-5 Pump Room**)	Pump Counter at 928555	
1152	Blank PE tube (**JP-5 Pump Room**)	Ser. No. B18002 [1st 4-hr PE Tube: Ser No. B18639 2nd 4-hr PE Tube Ser. No. B19194	PE Tuber pump Ser. No. 7-268-21 Glass Tube pump Ser. No. 566563
1214	Completed 2L (APL) Air Grab. (**JP-5 Pump Room**)	Final 16.77L(**JP-5 Pump Room**)	
1218	**Engine Room** 4-hr		

Date/Time	Event/Location	Issues/Misc.	Notes
	glass tube (GT) air samples pulled		
1221	**Engine Room** 2-hr glass tube (GT) air samples pulled		
1224	**Engine Room** began next 4-hr (2nd) and 2-hr (3rd) glass tube (GT) and PE air samples		
1305	Noted pump (JP-5) loud (**JP-5 Pump Room**)		Noted upon arrival at space
1320	Pump Secured **JP-5 Pump Room**		
1340	Pull (3rd) 2-hr charcoal/glass tube (GT) **JP-5 Pump Room**		
1344	Began 4th 2-hr Tube #1 **JP-5 Pump Room**		
1345	Began 4th 2-hr Tube #2 **JP-5 Pump Room**		
1424	Pull (3rd) 2-hr glass tubes **Engine Room**	Painting in engineering room	Paint Contents (CAS #): Silicon (NE), Calcium Carbonate (1317-65-3), Mineral Spirits (8052-41-3), Solvent (64742-95-6), Zinc Oxide (1314-13-2), Titanium Dioxide (13463-67-7), Cobalt Compounds (7440-48-4)
1425	Began 4th 2-hr Tube #1 **Engine Room**		
1427	Began 4th 2-hr Tube		

Date/Time	Event/Location	Issues/Misc.	Notes
	#2 **Engine Room**		
1515	**JP-5 Pump Room** (for charcoal/glass (GT)) was "LOW BATTERY" "HOLD"	Switched Pumps…New pump Ser. No. 566439 (Need to run until 1617 to get 8-hr sample)	Note that a JP-5 spill (in collect tray under JP-5 Purifier No. 2) was present from 0900 on. Also, small JP-5 leaks in main pumps (SOP).
1534	Pull IPCS 8-Hr Samples **JP-5 Pump Room**		
1539	Pull PE tube **JP-5 Pump Room**	Pump Counter 953498	
1612	Pull IPCS 8-Hr Samples **Engine room**		
1617	Pull 8-hr (final) Glass tubes (GT) **JP-5 Pump Room**		
1620	**Engine Room** Pull PE Tube (8-hr)	Pump counter 507174	
1621	**Engine Room** Pull 8-hr (final) Glass tubes (GT)		
1830	Pull 24-hr IPCS from **Engine Room**		
25 Aug (Saturday)	**BIO Medical & Signal Bridge Shelter**		Note that CO detector (well deck) alarms at 50 ppm (TLV is 25 ppm)
0653	Setup/start Bio Collector (**Medical**)		
0709	Setup/start Bio Collector (**Signal Bridge Shelter**)	Note that IPCS "special" SKC board was relocated by ships personnel (eliminated closet locker)	

Date/Time	Event/Location	Issues/Misc.	Notes
0745	Setup analyzer/extractor (**Medical**)	Issues: Strap-down required for shipboard deployment. Gabs/collector disks (which need to be associated when collecting is completed, somewhat impractical	Explanation for ports (rear of analyzer) desired. "Dumb it down". Battery charger needs instruction. Battery labeled "this side up", but incorrect for battery charger. Battery level indicator required (ALL).
0810	Collect 24-hr IPCS from **JP-5 Pump Room.**		Note; NEPMU-2 has collected a JP-5 sample for analysis
0819	Bio Collector was NOT running (Medical)	Swapped out battery and also disk (in case disk was not seating correctly)	Tough to get battery seated "Pain in the …" (Chief select)
0825	Call to **Signal Bridge Shelter**; Bio Collector NOT running there either.	COA; charge up two batteries and essentially start again at 1500.	
0915	5 AAVs in Well-deck	Started at ~0900	No noticeable fumes in well deck ("Upper V" [vehicle]). Good air flow.
0935	9 AAVs in		
0950	11 (all) AAVs	Note IPCS board AOK. Note also that IPCS relocate was from frame 104 to frame 81	Weather-nice (SS ~2)
0953	Raising well deck gate		
1026	Raising anchor (lowered at 0600)		
1200	**Medical** Bio collector off!	Will restart at 1500 with charged	

Date/Time	Event/Location	Issues/Misc.	Notes
		batteries.	
1213	1st wave of AAVs depart.		Fumes in well deck ("Upper V") much more noticeable.
1231	All AAVs off.		
1455	Swapping battery on nonfunctional battery in **Medical**	Running but VERY noisy (can here it 20 yds away around corner.) Required 2+ minutes to swap out battery.	
1530	**Medical** NOT running	Very warm, issue with vertical configuration? Plan to monitor in office.	Turned out it was a broken disk (magnetic coupling was off) Ser. No. 12345NI9
1542	**Signal Bridge Shelter** (SBS) exchange battery took 8 minutes for SC (20-yr) to get it. Collector not running with this battery	Status: Collector from Medical now in SBS. Collector SBS not running (seems like two batteries are not holding charges). [Switching batteries indicated that collector works with power.]	For LT P: Paint Ser. No. 8010-00-582-5382
1602	Set collector outside for CIWS firing (in case there might be any contamination concerns.	Collector placed on deck, not secured	Close-In Weapon System (CIWS)
1621	CIWS fired (~1 sec burst)	[No noticeable smell.]	
1628	CIWS fired	101 dB (inside shelter)	
1633	CIWS fired	137.6 dB (outside shelter)	Safety observer, phone talker and other personnel outside (only single ear protection).

Date/Time	Event/Location	Issues/Misc.	Notes
2300	Swapped out collector disk is Signal Bridge Shelter. Could not swap out battery! Could not open collector (ship's personnel tried also). Will reattempt in AM. Left running (new disk/old battery)	Anticipate running out of juice…requested that SBS personnel note time that it ends. Note new disk was relatively noisy compared with the previous. 1st "good" disk was Ser. No. 12345NI10 (stored in refrigerator).	Replacement disk is 12345NI11.
26 Aug (Sunday)	**BIO ~~Medical~~ & Signal Bridge Shelter (continued)**		
0700	HM2 Yett training HM2 Roach and analyzing 1st disk from SBS (#12345NI10)	Used Assay Disk Type A (I think all are Type A), that is, all three target and all three test agents.	Comments; extractor/analyzer could have simple instructions on it (for example, "wait 30 minutes after extraction for analysis".) Tracking of collection disks/plastic bags with serial number/assay disk needs some procedural work.
0706	Washing/extraction process initiated.		Recommend providing a latch for battery/extractor. Can easily be removed midstream.
0710	Done extracting	Did not appear that enough liquid was	Will run and se what analyzer says.

Date/Time	Event/Location	Issues/Misc.	Notes
		deposited on the assay. Also did not observe significant wicking of fluid.	Waiting 30 minutes.
0720	Swap out battery (successfully) in Signal Bridge Shelter. Took 4-minutes, 1 Leatherman ® & signalman. Some difficulty in shutting collector/disk opening…forced shut.	Note that, as expected, SBS power was out. Still collected disk and will analyze (Ser. No. 12345NI11)	
0724	**Signal Bridge Shelter**	Collection #3 initiated.	Disk #12345NI12
0745	Verified that without Ser. No. barcode from collection disk that analyzer would recognize. [There were two bags/disks…minor confusion about which one was the correct bag/bar code. Correctly identified.		
0746	Now analyzing (with barcode in place).	Result: All invalid. (Apparently not enough liquid)	
0753	Reran through entire extraction process.	At least 3 drops seen per semi-cycle…but whickering still not evident.	
0813	(early) reanalyzing.		
0815	Results in.	Oval Bumin not detected. BG invalid test. MS2 invalid test. B. Anthracis invalid test.	

Date/Time	Event/Location	Issues/Misc.	Notes
		Y. Pestis invalid test. Ricin invalid test.	
0827	Reran analysis…in case time period was not sufficient.	Same result.	
0830	Added water direct to assay disk (unmeasured).	Whickering obvious this time. Waiting 30 minutes.	
0900	Reanalysis (4th attempt) (#12345NI10)	Oval Bumin not detected BG not detected MS2 not detected B. Anthracis DETECTED!!! Y. Pestis DETECTED!!! Ricin not detected	OK, this would appear to be bad.
1520	**Signal Bridge Shelter**; replacing collector #1 with collector #2 (collection disk #12345NI7).	SBS collector (#1) was still running. Collected & refrigerated disk #12345NI12	Labeled collectors (good idea).
1540	Running collector #1 with non-recharged battery in office to see when runs out of juice.	With disk #12345NI6.	
1650-1730	Battery ran an additional 1-1½ hours.		
1918	Reanalyzed Disk 12345NI10 to verify earlier results.	Good and bad news; results same (good) results same (bad)	
2300	**Signal Bridge Shelter**; swap out sampler #2 (with 12345NI7) with sampler #1 (with 12345NI2). (Still running)	Retrieved and refrigerated 12345NI7)	

Date/Time	Event/Location	Issues/Misc.	Notes
27 Aug (Mond y)	**BIO ~~Medical~~ & Signal Bridge Shelter (continued)**		Considering "DA" test with one collector disk.
0630	**Signal Bridge Shelter**; swap out sampler #1 (with 12345NI2) with sampler #2 (with 12345NI4). (Still running)	12345NI2 collected and refrigerated Swap done prior to 0645 GQ Plan to take sampler #1 (with partially recharged battery) to well deck during LCAC operations (0800-1200). Disk No. 12345I3	*Replacing collectors with recharged batteries (in place) is much easier than swapping batteries (particularly at night).*
0821	**Well-deck;** LCAC Ops Begin active 2L air grab (APL). LWBAS on (#12345I3)	Start volume; 16.77L Ser. No. 01684. LCAC in well deck exits.	All IPCS OK.
0825	LCAC enters well-deck		
0827	LCAC exits well deck.		
0829	LCAC enters (stops)	Rider disembarks.	
0835	LAC starts		
0836	LCAC exits	Salt spray evident	
0844	LCAC enters		
0847	LCAC exits		
0850	LCAC enters		
0853	LCAC exits		
0855	LCAC enters	(Very smooth operator)	
0857	LCAC exits	Much spray	
0902	LCAC enters		
0903	Complete "2L" air grab (APL)	Final vol. 18.88L (0.11 over)	6 LCAC entry/exits during air grab
0904	LCAC exits		
0908	LCAC enters		

Date/Time	Event/Location	Issues/Misc.	Notes
0909	LCAC exits	Some spray	
0914	LCAC enters		
0915	LCAC exits (immediately)		
0916	LCAC enters (immediately)		
0918	LCAC exits &		
0919	LCAC immediately enters		
0920	LCAC exit		
0923	LCAC enters		
0925	LCAC exits	Last one for awhile	Reportedly, 2 (of 4?) LCACs were casualties
1010	LCAC enters	Several riders embark on LCAC	
1021	LCAC exits	Last one	
1024	Raising Well Deck gate.		
1025	Turned off LWBAS (Collector #1)	Disk 12345NI3 (refridge/medical)	Note: Refrigeration is at 4°C
1219	Deliberate abuse test (sea water) (12345NI1) (Well Deck)		
1510	**Signal Bridge Shelter**; Swap Collector #2 with Collector #1 (collected 12345NI4, deployed 12345NI5)	Could not access signal bridge due to CIWS, security did it for us.	
1604	Medical: Analyzing disks. Begin with 12345NI4.	Almost added water via priming.	
1608	Battery seemingly died. No water went in.		
1612	Re-extract complete with new battery.	Good whickering	

Date/Time	Event/Location	Issues/Misc.	Notes
	12345NI4		
1613	Begin 12345N11		Note; each and every holder requires the use of the screwdrivers.
1617	Water coming out side of holder (post extraction examination seemed to indicate that the screws were tight.		
1620	Extraction complete (12345NI11)		
1622	Begin N12345NI2		
1626	Water overflowing (top). Did not seem to get into chamber.		
1635	Extraction run again (NI2) but no water came out.	Post extraction examination indicated that holder (flap?) sealed opening.	Manual extraction performed.
1636	Began 12345NI7		
1638-1642	Extraction (successful)		
1643	Analyzing 12345NI4	Results: Oval Bumin not detected BG not detected MS2 not detected B. Anthracis not detected Y. Pestis not detected Ricin *INVALID* test	
1644	Begin 12345NI6		
1651	Extraction complete		
1652	Begin 12345NI1		
1652	No water (battery replaced)		

Date/Time	Event/Location	Issues/Misc.	Notes
1654	Analyzing 12345NI11	Went through 3 (or 4) agents and THEN said no barcode. Retried; results; Oval Bumin not detected BG not detected MS2 not detected B. Anthracis not detected Y. Pestis not detected Ricin not detected	
1655	Re-extract 12345NI1	Powered off/on to see if this would clear extractor "problems". Water was also leaking out center O-ring of holder	Arm on extractor vibrating (grinding noises also).
1703	Manual extraction of 12345NI1		
1704	Begin 12345N3		
1705	Analyze 12345NI2	Results: Oval Bumin INVALID BG INVALID MS2 INVALID B. Anthracis INVALID Y. Pestis INVALID **Ricin INVALID**	
1706	Extractor doesn't seem to be working at all.	Decided to leave and charge batteries and try again tomorrow.	
1712	Analyzing 12345NI7	Couldn't read barcode/reset disk	
1715	After 3 (or 4) agents said could not read barcode.		

Date/Time	Event/Location	Issues/Misc.	Notes
1721	Analysis 12345NI7 complete	Results: Oval Bumin not detected BG not detected MS2 not detected B. Anthracis not detected Y. Pestis not detected Ricin not detected	
1725	Analyzing 12345NI6	Results: Oval Bumin not detected BG not detected MS2 not detected B. Anthracis not detected Y. Pestis not detected Ricin not detected	
1733	Analyzing 12345NI1	Results: Oval Bumin not detected BG not detected MS2 not detected B. Anthracis not detected Y. Pestis not detected Ricin not detected	Recommend checklist for analysis process. Recommend troubleshooting guidelines.
2300	**Signal Bridge Shelter**; Swap out Collector/Sampler #1 (12345NI5) with Collector #2 (12345AA03)	Collected- refrigerated 12345NI5. #1 was off, battery!	
28 Aug (Tuesday)	**BIO ~~Medical~~ & Signal Bridge Shelter (continued)**		Note, entry to medical adjacent to 01-73-5 is open and ladder goes up to

Date/Time	Event/Location	Issues/Misc.	Notes
			hatch which opens to weather deck, obvious contamination vulnerability.
0700	**Signal Bridge Shelter**; Swap out Collector/Sampler #2 (12345AA03) with Sampler #1 (12345AA01)	Collected-refrigerated 12345AA03 #2 was off, was turned off!	Will run in office until power out to estimate shut off time. Other possibility is that it was not turned on (or inadvertently turned off) when deployed, a result of darkness and vent noises.
0725	**Office**; running Sampler #2 with 12345AA04 (no recharge on battery).		
0900-0910	**Signal Bridge Shelter**; Remove 7-day IPCS including SKC-special board 2		
1045	**Well Deck**; remove 7-day IPCS board		
1050	**Well Deck**; remove 7-day Special SKC board		
1125	**Oil Test Lab**; retrieve 7-day IPCS board		
1330	**JP-5 Pump Room**; retrieve 7-day IPCS board.		
1440	**Engine Room**; retrieve 7-day IPCS board.		
1500	**Signal Bridge Shelter**; retrieved LWBAS (Collector		

Date/Time	Event/Location	Issues/Misc.	Notes
	#1) with Disk 12345AA01		
1510	Secured "**Office**" LWBAS (Collector #2) with Disk 12345AA04	Battery lasted all day, suspect, therefore, that was never on previous night (that would impact Disk #12345AA03)	
1540	**Medical** ; analyzing LWBAS/A disks		
1542	Commence extraction on 12345AA04	Extractor making grinding noises	Sounds like a percolator
1543	Extractor Stopped	Incomplete cycle (swapped out battery for good measure).	
1545	Start again	Same grinding noise, "rinse" cycle very frothy.	
1546	More grinding/percolating		
1547	2 drops only!		
1548	2nd run to get enough fluid onto assay disk		
1549	4 drops during 1st rinse (no 2nd rinse)		
1550	Complete Extraction		
1554	Begin extraction 12345AA03		
1555	Grinding noises, 1 cycle of H_2O		
1556-1558	Stopped running	Push start button, needle inserted, no H_2O delivered, push start, H_2O delivered, no rinse/spin cycle, push start again, H_2O delivered, spin cycle	
1600	Manual delivery of liquid to disk		

Date/Time	Event/Location	Issues/Misc.	Notes
1604	Begin extraction of 12345NI12	Same problems, not completing cycles, grinding noises, etc., etc.	
1608	Manual extraction of liquid	Note: rust forming on end of disk holder post on extractor	
1615	Begin extraction of 12345AA01	H_2O delivery to disk, 1st spin cycle (very quiet: different), air delivery, 2nd H_2O delivery & spin cycle. No H_2O to disk.	Will not analyze or continue with extraction process. Will analyze those that have been extracted already.
1621	Begin analysis 12345AA04		
1622	NO BARCODE displayed	Disk removed/replaced-pushed [run disk].	
1623	NO BARCODE displayed	Barcode removed and replaced (did not look bad) but worked this time.	
1625	Analysis complete 12345AA04	Results: Oval Bumin not detected BG not detected MS2 DETECTED B. Anthracis not detected Y. Pestis DETECTED Ricin not detected	
1630	Begin analysis 12345AA03	No problems	
1633	Analysis complete 12345AA03	Results: Oval Bumin not detected BG DETECTED MS2 not detected	

Date/Time	Event/Location	Issues/Misc.	Notes
		B. Anthracis not detected Y. Pestis DETECTED Ricin not detected	
1638	Begin analysis 12345NI12		
1641	Analysis complete 12345NI12	Results: Oval Bumin *INVALID* BG *INVALID* MS2 not detected B. Anthracis *INVALID* Y. Pestis *INVALID* Ricin not detected	
29 Aug (Wednesday)	**Medical**/**Analyzer**: Reanalysis of 12345AA03 and 12345AA04		
1155	12345AA03 Reanalysis Complete	Results: Oval Bumin *DETECTED* BG *DETECTED* MS2 *DETECTED* B. Anthracis *DETECTED* Y. Pestis *DETECTED* Ricin *INVALID*	Results are different!!! 4 of 6!
1158	12345AA04 Reanalysis	Results: Oval Bumin *DETECTED* BG *INVALID* MS2 *INVALID* B. Anthracis *DETECTED* Y. Pestis not detected Ricin not detected	Results are different!!! 5 of 6!

Date/Time	Event/Location	Issues/Misc.	Notes
			(add manual barcode/serial number to analyzer??? No, the problem is not the barcode per se it is the alignment of the assay disk.)

Compartment	Environment
Well-Deck	During LCAC Ops, humid (plus some spray), multiple air exchanges but extremes of hot gases and winds.
Signal Bridge (Shelter)	Weather dependant, adequate ventilation (with hatch open at all times) but warmer than weather deck (outside). Expecting ventilation (A/C) improvements.
Oil Test Lab	AC Space, "well vented" (although ventilation/AC secured on day of air sampling), oil/chemical fumes however.
Engine Room	Warm/dry, multiple vents.
JP-5 Pump Room	Vented but continuous fuel odor.

Appendix B

Data From Sampler Analyses

GORE 8 hr

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3 ng NOSTD	Nonanal ng NOSTD	DMN NOSTD ng
STD 2.5 IWO-7 5:1	3	3	2	3	3	3	4	4	5		8	17
STD 5 IWO-6 5:1	4	5	5	5	5	5	6	6	6		6	0
STD 15 IWO-5 5:1	15	15	14	15	15	16	16	16	15		3	0
STD 50 IWO-4 5:1	51	50	224	49	51	138	51	47	43		48	0
STD 100 IWO-4 5:1	100	100	100	100	99	100	99	101	103		97	0
STD 150 IWO 3 5:1	159	146	170	155	131	159	154	158	174		150	1
MT TUBE	0	0	0	0	0	0	0	0	0			
SIGNAL BRIDGE BLK	3	1	0	0	1	99	0	17	0		11	9
GORE #52	2	3	0	7	26	10	33	25	6	68	222	8
GORE #53	2	3	0	7	28	9	24	26	11	42	261	7
GORE #54	1	3	0	7	28	7	26	23	7	30	199	5
AVERAGE	2	3	0	7	28	9	27	25	8	46	227	7
%RSD	35.5	11.3	0.0	1.7	4.4	15.6	17.2	5.5	31.7	41.1	14.0	23.2
STD 2.5	2	2	2	2	2	2	2	2	2		3	
WELL DECK BLANK	3	2	0	0	0	96	6	18	29		35	16
GORE #22	3	7	0	29	86	11	96	97	96	46	168	89
GORE #23	3	7	0	26	79	10	77	72	59	38	148	72
GORE #24	3	7	1	30	86	10	92	91	70	59	195	82
AVERAGE	3	7	0	29	84	10	88	86	75	48	171	81
%RSD	7.9	1.3	173.2	7.1	4.7	4.5	11.4	15.1	25.1	21.2	13.7	10.8
STD 5	4	5	5	5	5	5	5	5	4		4	
ENGINE ROOM BLANK	3	2	0	0	0	94	0	0	0			
GORE 67	2	9	0	59	100	4	39	24	11	97	279	13
GORE 68	2	10	0	68	101	4	45	25	14	109	292	20
GORE 69	0	9	1	57	100	4	40	27	14	98	260	20
AVERAGE	2	9	0	61	100	4	41	25	13	101	277	18
%RSD	64.0	8.0	173.2	9.7	0.5	7.5	8.6	6.9	12.3	7.0	5.7	21.7
STD 15	14	14	15	16	16	16	18	18	53		10	
OIL TEST LAB BLANK	4	2	10	0	0	97	7	22	0			53
GORE 7	9	14	0	58	116	53	119	86	66	135	107	42
GORE 8	9	16	0	55	106	46	101	74	63	91	102	33
GORE 9	7	12	0	51	104	47	107	87	68	90	87	42
AVERAGE	8	14	0	55	108	49	109	82	66	105	99	39
%RSD	11.6	13.6	0.0	6.4	6.4	7.2	8.0	8.8	3.5	24.2	10.2	14.1
STD 50	28	27	325	32	34	31	37	39	41		4	1
PUMP ROOM BLANK	3	6	0	9	29	91	69	49	26	31		
GORE 37	6	38	0	106	142	44	426	369	391	225		469
GORE 38	4	35	0	100	142	38	420	345	365	285		618
GORE 39	5	45	0	123	152	49	448	401	383	235		360
AVERAGE	5	39	0	110	146	44	431	372	380	248		482
%RSD	17.5	12.9	0.0	11.2	3.7	13.0	3.4	7.7	3.5	13.1		26.8
STD 100	98	100	99	102	103	98	99	103	113			

SKC 8 hr

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	MB 1,2,3- NOST ng NOSTD	Nonanal ng NOSTD	DMN NOSTD ng
STD 5 IWO-6 5:1	5	5	4	5	6	5	6	5	6	0	0	0
STD 15 IWO-5 5:1	15	15	13	16	17	16	18	16	17	0	0	0
STD 50 IWO-4 5:1	49	51	50	52	62	54	58	57	56	0	0	0
STD 150 IWO-3 5:1	148	150	150	149	146	148	147	147	148	0	0	0
STD 300 IWO-3 5:1	467	235	406	287	199	325	251	239	227	0	0	0
MT TUBE	0	0	0	0	0	0	0	0	0	0	0	0
SIGNAL BRIDGE BLK	165	19	0	28	95	89	65	68	11	48	133	39
SKC #52	170	13	0	31	107	57	70	56	11	126	78	61
SKC #53	137	10	0	28	101	75	57	50	12	74	69	63
SKC #54	184	19	0	45	124	59	108	70	13	171	104	61
AVERAGE	164	14	0	35	111	64	78	58	12	124	84	62
%RSD	14.6	31.1	0.0	25.6	10.7	16.3	33.5	17.0	5.7	39.1	21.4	1.8
STD 2.5	3	2	2	3	3	3	3	3	2	0	0	0
WELL DECK BLANK	139	11	0	19	65	76	55	60	12	101	87	40
SKC #22	172	18	0	50	125	95	160	89	73	116	56	67
SKC #23	172	17	24	44	120	33	110	82	49	132	66	56
SKC #24	200	20	0	51	132	79	208	99	54	195	120	63
AVERAGE	181	18	8	48	126	69	159	90	58	148	81	62
%RSD	9.1	9.2	173.2	8.0	4.9	46.9	30.9	9.9	21.7	28.0	42.4	9.2
STD 5	5	5	4	7	13	5	7	6	6	3	0	0
ENGINE ROOM BLANK	148	11	0	18	62	50	51	37	8	88	66	41
SKC 67	154	24	0	88	151	72	79	59	16	161	33	47
SKC 68	176	24	0	97	155	56	56	53	17	149	45	63
SKC 69	136	22	0	82	138	61	60	55	18	122	48	59
AVERAGE	155	23	0	89	148	63	65	56	17	144	42	56
%RSD	12.7	5.2	0.0	8.6	6.3	13.2	18.5	5.3	7.7	13.8	19.2	14.2
STD 15	14	14	431	14	17	14	16	15	15	0	10	0
OIL TEST LAB	155	12	0	23	75	74	0	44	8	121	48	20
SKC 7	99	22	30	73	146	80	132	87	47	125	44	39
SKC 8	212	29	0	72	151	103	123	106	53	189	81	56
SKC 9	131	22	0	71	150	107	118	91	45	172	51	47
AVERAGE	147	24	10	72	149	97	125	94	48	162	59	47
%RSD	39.4	17.4	173.2	0.9	1.7	15.1	5.5	10.5	8.3	20.6	33.3	17.9
STD 50	52	55	55	57	67	56	67	62	60	0	0	0
PUMP ROOM BLANK	138	12	0	13	46	71	51	45	14	77	55	23
SKC 37	166	59	0	126	190	93	441	372	304	328	0	639
SKC 38	154	60	0	129	193	77	453	378	341	319	0	764
SKC 39	195	63	0	127	192	95	495	378	313	168	0	653
AVERAGE	172	61	0	127	192	88	463	376	319	272	0	685
%RSD	12.2	3.5	0.0	1.6	0.6	11.1	6.1	0.9	6.0	33.1	0.0	10.0
STD 150	147	146	161	151	141	145	148	146	146	0	0	0

SKC LOW FLOW

Data File Name	Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng NOSTD	TMB 1,2,3- ng NOSTD	Nonanal ng NOSTD	DMN ng NOSTD	MeS ng
lwo230.d	LF SKC H (MeS)	0	5	0	8	25	18	31	50	12	32	94	30	7
lwo231.d	LF SKC A (MeS)	0	5	0	8	26	17	36	54	13	40	87	68	61
lwo232.d	LF SKC C (MeS)	0	5	0	8	26	18	39	52	12	36	79	77	61
lwo233.d	LF SKC B (MeS)	0	5	0	8	26	16	46	54	11	38	97	55	60
lwo234.d	LF SKC D (MeS)	0	5	0	8	24	13	44	51	11	67	81	54	79
lwo262.d	LF SKC E (MeS)	0	5	0	8	25	15	46	53	10	82	88	56	71
lwo263.d	LF SKC F (MeS)	0	5	0	8	26	15	51	55	9	76	86	53	65
lwo264.d	LF SKC G (MeS)	0	5	1	8	25	13	40	53	9	51	83	50	68
	AVERAGE	0	5	0	8	25	15	43	53	11	56	86	59	66
	% RSD	#DIV/0!	5%	247%	3%	3%	12%	15%	3%	14%	35%	7%	23%	33%
	SIGNAL BRIDGE													
lwo236.d	LF SKC 87 SIG BR	216	51	0	266	400	60	183	74	23	553	115	27	36
lwo237.d	LF SKC 77 SIG BR	206	48	0	265	401	31	156	58	23	449	68	27	37
lwo238.d	LF SKC 82 SIG BR	187	43	0	242	376	40	142	54	21	403	44	0	30
lwo265.d	LF SKC 76 SIG BR	208	48	5	256	409	45	149	60	22	468	73	18	39
lwo266.d	LF SKC 78 SIG BR	219	50	0	279	429	39	144	60	21	430	65	67	46
lwo268.d	LF SKC 79 SIG BR	220	51	0	270	416	43	142	57	21	405	52	27	42
lwo269.d	LF SKC 84 SIG BR	172	44	0	262	412	28	129	43	20	332	19	0	43
	AVERAGE	204	48	1	263	406	41	149	58	22	434	62	24	39
	% RSD	9%	6%	265%	4%	4%	25%	11%	16%	6%	16%	48%	95%	13%
	SIGNAL BRIDGE POST SPIKE													
lwo243.d	LF SKC 81 SIG BR PS	231	53	0	271	413	70	165	90	28	526	84	70	98
lwo244.d	LF SKC 83 SIG BR PS	230	52	0	273	404	65	160	87	23	489	93	76	101
lwo245.d	LF SKC 88 SIG BR PS	217	54	0	281	412	66	163	68	23	511	85	76	99
lwo275.d	LF SKC 80 SIG BR PS	215	53	0	290	448	42	150	62	24	400	50	45	117
lwo276.d	LF SKC 85 SIG BR PS	187	47	0	257	395	49	130	52	22	420	60	48	102
lwo277.d	LF SKC 86 SIG BR PS	221	52	0	278	436	43	148	61	24	467	60	49	109
	AVERAGE	217	52	0	275	418	56	153	70	24	469	72	61	104
	% RSD	7%	4%	#DIV/0!	4%	5%	23%	8%	22%	9%	11%	24%	24%	7%
	WELL DECK													
lwo270.d	LF SKC 90 WELL DECK	103	82	0	464	660	59	398	274	163	593	17	86	32
lwo271.d	LF SKC 92 WELL DECK	123	81	0	441	606	66	389	273	157	696	58	113	52
lwo272.d	LF SKC 96 WELL DECK	111	82	0	450	653	69	394	267	158	661	25	135	33
lwo274.d	LF SKC 99 WELL DECK	91	80	0	453	656	73	392	263	157	612	9	77	29
lwo239.d	LF SKC 91 WELL DECK	113	82	0	447	604	69	405	273	158	759	54	92	92
lwo240.d	LF SKC 95 WELL DECK	100	77	0	432	597	72	395	256	154	675	23	95	31
lwo242.d	LF SKC 101 WELL DECK	112	80	0	443	614	84	399	268	157	722	51	134	28
	AVERAGE	107	81	0	447	627	70	396	268	158	674	34	105	42
	% RSD	10%	2%	#DIV/0!	2%	4%	11%	1%	2%	2%	9%	59%	22%	56%
	WELL DECK POST SPIKE													
lwo278.d	LF SKC 89 WELL DECK PS	118	86	0	454	664	100	416	277	161	669	41	123	97
lwo280.d	LF SKC 94 WELL DECK PS	102	80	0	449	644	69	393	266	159	605	14	85	93
lwo281.d	LF SKC 100 WELL DECK PS	115	86	0	457	654	96	409	270	153	681	32	99	87
lwo246.d	LF SKC 93 WELL DECK PS	90	81	0	452	611	66	397	264	159	499	9	105	89
lwo248.d	LF SKC 98 WELL DECK PS	104	83	0	458	638	86	400	272	161	695	25	188	83
lwo249.d	LF SKC 97 WELL DECK PS	103	82	0	442	605	76	388	270	159	634	33	110	80
	AVERAGE	105	83	0	452	636	82	401	270	159	631	26	118	88
	% RSD	10%	3%	#DIV/0!	1%	4%	17%	3%	2%	2%	11%	47%	31%	7%

SKC 7 day check run

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3- ng NOSTD	Nonanal ng NOSTD	DMN NOSTD ng
STD 10 SPLIT	0	9	8	8	0	9	9	0	1	0	0	0
STD 10 SPLIT 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 50 SPLIT	0	51	1345	50	0	589	63	4	5	0	0	34
STD 50 SPLIT 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 100 SPLIT	0	95	107	91	2	98	111	12	30	127	16	4
STD 100 SPLIT 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
MT TUBE	0	0	0	0	0	0	0	0	0	0	0	0
MT TUBE 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
SKC 58 7D SIGNAL BRIDGE	311	56	0	412	461	52	256	117	52	636	670	0
SKC 58 2ND DESORB	0	0	0	0	0	0	0	0	0	0	0	0
SKC 43 7D PUMP ROOM	0	968	0	2325	1940	0	5131	3249	2700	0	0	5510
SKC 43 2ND	0	0	0	0	0	0	0	0	0	0	0	13
SKC 28 7D WELL DECK	97	148	1304	691	682	97	646	505	391	1300	944	192
SKC 28 2ND	0	0	0	0	0	0	0	0	0	0	0	0
SKC 73 7D ENGINE ROOM	25	63	866	560	582	56	536	354	184	822	529	82
SKC 73 2ND	0	0	0	0	0	0	0	0	0	0	0	0
SKC 13 7D OIL TEST LAB	489	474	826	3379	1273	371	1155	709	642	2230	0	757
SKC 13 2ND	0	0	0	0	0	0	0	0	0	0	0	0
STD 10	0	10	3928	11	0	33	55	7	2	0	0	0
STD 10 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 50	0	51	551	55	0	243	68	0	0	0	0	0
STD 50 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 100	0	95	120	98	0	114	142	40	83	0	0	0
STD 100 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0

SKC 7 day check run

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3- ng NOSTD	Nonanal ng NOSTD	DMN NOSTD ng
STD 10 SPLIT	0	9	8	8	0	9	9	0	1	0	0	0
STD 10 SPLIT 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 50 SPLIT	0	51	1345	50	0	589	63	4	5	0	0	34
STD 50 SPLIT 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 100 SPLIT	0	95	107	91	2	98	111	12	30	127	16	4
STD 100 SPLIT 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
MT TUBE	0	0	0	0	0	0	0	0	0	0	0	0
MT TUBE 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
SKC 58 7D SIGNAL BRIDGE	311	56	0	412	461	52	256	117	52	636	670	0
SKC 58 2ND DESORB	0	0	0	0	0	0	0	0	0	0	0	0
SKC 43 7D PUMP ROOM	0	968	0	2325	1940	0	5131	3249	2700	0	0	5510
SKC 43 2ND	0	0	0	0	0	0	0	0	0	0	0	13
SKC 28 7D WELL DECK	97	148	1304	691	682	97	646	505	391	1300	944	192
SKC 28 2ND	0	0	0	0	0	0	0	0	0	0	0	0
SKC 73 7D ENGINE ROOM	25	63	866	560	582	56	536	354	184	822	529	82
SKC 73 2ND	0	0	0	0	0	0	0	0	0	0	0	0
SKC 13 7D OIL TEST LAB	489	474	826	3379	1273	371	1155	709	642	2230	0	757
SKC 13 2ND	0	0	0	0	0	0	0	0	0	0	0	0
STD 10	0	10	3928	11	0	33	55	7	2	0	0	0
STD 10 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 50	0	51	551	55	0	243	68	0	0	0	0	0
STD 50 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0
STD 100	0	95	120	98	0	114	142	40	83	0	0	0
STD 100 2ND RUN	0	0	0	0	0	0	0	0	0	0	0	0

SKC 7 day

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3- ng NOSTD	Nonanal ng NOSTD	DMN NOSTD ng
STD 100 IWO-4 100:1	134	191	98	89	88	85	80	90	85	0	0	0
STD 300 IWO-3 100:1	302	371	277	284	262	291	191	165	311	0	0	0
STD 1000 IWO-2 100:1	1168	1323	1647	1883	1973	2153	2627	4051	7565	0	0	0
STD 2000 IWO-1 100:1	1996	1935	1954	1961	1944	1952	1979	1983	1941	0	0	0
MT TUBE	0	0	0	0	0	0	0	0	0	0	0	0
SIGNAL BRIDGE												
SKC 59	340	67	0	760	1452	92	535	306	239	1041	0	0
SKC 60	355	68	0	789	1471	91	553	310	260	1031	0	0
AVERAGE	352	68	0	775	1461	91	544	308	250	1036	0	0
WELL DECK												
SKC 29	112	181	0	1821	4523	208	2220	2186	2384	2221	75721	17393
SKC 30	129	191	0	1828	4494	180	2193	2135	2410	1883	66958	25451
AVERAGE	121	186	0	1824	4509	194	2207	2160	2397	2052	71340	21422
STD 500	444	450	483	480	476	459	464	414	426	0	0	0
ENGINE ROOM												
SKC 74	0	93	0	1281	3331	89	1678	1348	1364	1528	36436	15260
SKC 75	0	78	0	1068	2813	85	1352	1078	1067	1205	23654	12140
AVERAGE	0	85	0	1175	3072	87	1515	1213	1216	1366	30045	13700
OIL TEST LAB												
SKC 14	510	617	0	6196	6291	682	5965	4490	4837	6062	121692	48778
SKC 15	494	591	0	5839	6141	613	5545	3943	4352	5749	98601	42785
AVERAGE	502	604	0	6017	6216	647	5755	4217	4594	5905	110147	45781
STD 1000	1068	1168	1141	1506	1542	1675	1849	2764	5450	0	0	0
PUMP ROOM												
SKC 44	0	1465	0	7019	7414	623	24421	33323	58661	9083	0	1551496
SKC 45	0	1421	940	7475	8124	484	28156	38141	63948	10136	0	1705727
AVERAGE	0	1443	470	7247	7769	554	26288	35732	61304	9610	0	1628611
STD 2000	2105	2096	2118	2065	1979	1952	1853	1712	1464	0	0	0

GORE 7 day

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	MB 1,2,3- NOST ng NOSTD	Nonanal ng NOSTD	DMN ng NOSTD
STD 100 IWO-4 100:1	32	85	57	37	25	29	38	35	80	0	0	0
STD 300 IWO-3 100:1	86	301	264	371	267	338	391	568	1122	0	0	0
STD 500 IWO-2 100:1	524	608	662	855	902	1009	1101	1876	4384	0	0	0
STD 1000 IWO-2 100:1	1079	1106	1045	1050	912	950	849	666	833	0	0	0
STD 2000 IWO-1 100:1	1933	1875	1919	1907	1949	1943	1976	1995	2028	0	0	0
MT TUBE	0	0	0	0	0	0	0	0	0	0	0	0
SIGNAL BRIDGE												
GORE 58	0	3	0	157	292	0	130	65	72	113	153	0
GORE 59	0	5	0	331	643	0	154	76	89	232	391	0
GORE 60	0	5	0	321	607	0	312	145	95	209	277	0
AVERAGE	0	4	0	269	514	0	199	95	85	185	274	0
%RSD	0	30	0	36	38	0	50	46	14	34	43	0
STD 500	414	449	413	469	447	526	367	496	618	0	0	0
WELL DECK												
GORE 28	0	13	0	637	2229	0	1332	1514	2279	450	340	130
GORE 29	0	15	0	601	2061	0	992	1132	1398	432	241	91
GORE 30	0	19	0	845	2912	0	1691	2078	3255	615	446	118
AVERAGE	0	16	0	694	2400	0	1338	1574	2311	499	342	113
%RSD	0	19	0	19	19	0	26	30	40	20	30	17
ENGINE ROOM												
GORE 73	0	4	0	309	922	0	1091	1304	1979	241	330	232
GORE 74	0	4	109	274	845	0	888	983	1574	227	0	200
GORE 75	0	4	0	305	908	0	1126	1322	2018	255	307	256
AVERAGE	0	4	36	296	892	0	1035	1203	1857	241	212	230
%RSD	0	9	173	6	5	0	12	16	13	6	87	12
STD 1000	967	973	1035	1047	1091	1104	1018	1086	1293	0	0	0
OIL TEST LAB												
GORE 13	33	90	0	2562	5296	92	4749	4669	7499	2930	1035	958
GORE 14	35	91	0	2309	4519	80	4217	3697	5469	2485	809	597
GORE 15	42	86	0	2444	4898	94	4292	4133	6844	2601	1334	838
AVERAGE	37	89	0	2439	4904	89	4420	4166	6604	2672	1060	797
%RSD	12	3	0	5	8	8	7	12	16	9	25	23
PUMP ROOM												
GORE 43	0	27	0	454	1495	76	7937	19258	50777	614	0	9133
GORE 44	0	29	39	473	1532	70	7788	18401	47482	718	0	10099
GORE 45	0	23	0	402	1351	101	7180	18245	47986	576	0	11873
AVERAGE	0	26	13	443	1459	82	7635	18635	48748	636	0	10369
%RSD	0	12	173	8	7	20	5	3	4	12	0	13
STD 2000	2028	2003	2132	1857	1832	1783	1385	1015	904	0	0	0

SKC 24 hr

Sample Name	MIBK ng	EBEN ng	TCA, 1,1,2,2- ng	TMB, 1,3,5- ng	TMB, 1,2,4- ng	LIM ng	UND ng	DOD ng	TRI ng	TMB 1,2,3- ng NOSTD	Nonanal ng NOSTD	DMN ng NOSTD
STD 5 IWO-6 15:1	6	6	4	5	5	5	6	6	7	0	0	0
STD 15 IWO-5 15:1	16	14	10	14	11	14	4	15	15	0	0	0
STD 50 IWO-4 15:1	53	53	40	46	41	40	43	30	15	0	0	0
STD 100 IWO-4 15:1	113	114	98	113	123	120	125	120	113	0	0	0
STD 150 IWO-3 15:1	165	166	153	169	184	171	178	167	148	0	0	0
STD 300 IWO-3 15:1	299	293	260	252	260	238	227	178	106	0	0	0
STD 500 IWO-2 15:1	504	484	492	484	476	486	480	484	491	0	0	0
MT TUBE	0	0	0	0	0	0	0	0	0	0	0	0
SIGNAL BRIDGE												
SKC 55	262	12	0	26	96	59	72	45	14	124	127	71
SKC 56	273	12	0	25	88	48	65	39	13	104	127	54
SKC 57	272	14	0	30	111	64	77	51	15	91	141	60
AVERAGE	269	13	0	27	98	57	71	45	14	106	132	61
%RSD	2.3	9.0	0.0	10.8	11.8	14.2	8.5	14.0	6.6	16.0	6.0	14.4
WELL DECK												
SKC 25	138	45	0	198	397	57	330	259	155	329	241	123
SKC26	128	44	0	184	390	50	299	253	152	339	171	147
SKC 27	132	45	0	182	395	93	304	260	152	297	166	113
AVERAGE	132	45	0	188	394	67	311	257	153	322	193	128
%RSD	3.9	1.4	0.0	4.6	0.8	34.3	5.3	1.5	1.3	6.9	21.8	13.8
STD 50	49	57	57	59	66	59	65	65	65	0	0	0
ENGINE ROOM												
SKC 70	147	29	0	125	304	97	127	82	22	282	179	28
SKC 71	63	19	0	93	211	33	90	55	24	243	149	71
SKC 72	141	38	0	181	388	95	196	123	42	458	191	37
AVERAGE	117	29	0	133	301	75	138	87	29	328	173	45
%RSD	40.1	34.4	0.0	33.5	29.4	48.8	39.3	39.6	37.6	35.0	12.5	48.8
STD 100	107	107	800	108	120	108	119	122	123	0	0	0
OIL TEST LAB												
SKC 11	164	57	0	178	408	196	399	280	164	384	225	120
SKC 12	153	62	0	179	403	241	392	300	166	411	233	165
SKC 10	158	58	0	187	428	210	424	290	168	317	326	119
AVERAGE	159	59	0	181	413	216	405	290	166	371	261	135
%RSD	3.3	4.3	0.0	2.7	3.1	10.7	4.1	3.4	1.3	13.0	21.4	19.4
PUMP ROOM												
SKC 40	98	304	0	513	574	89	1455	1063	968	748	0	2380
SKC 41	110	311	0	529	599	104	1564	1110	1031	837	0	2138
SKC 42	152	312	0	530	598	122	1521	1161	991	759	0	2392
AVERAGE	120	309	0	524	590	105	1513	1111	997	782	0	2303
%RSD	24.0	1.4	0.0	1.8	2.4	16.1	3.6	4.4	3.2	6.2	0.0	6.2
STD 150	160	159	160	142	152	127	117	96	68	0	0	0

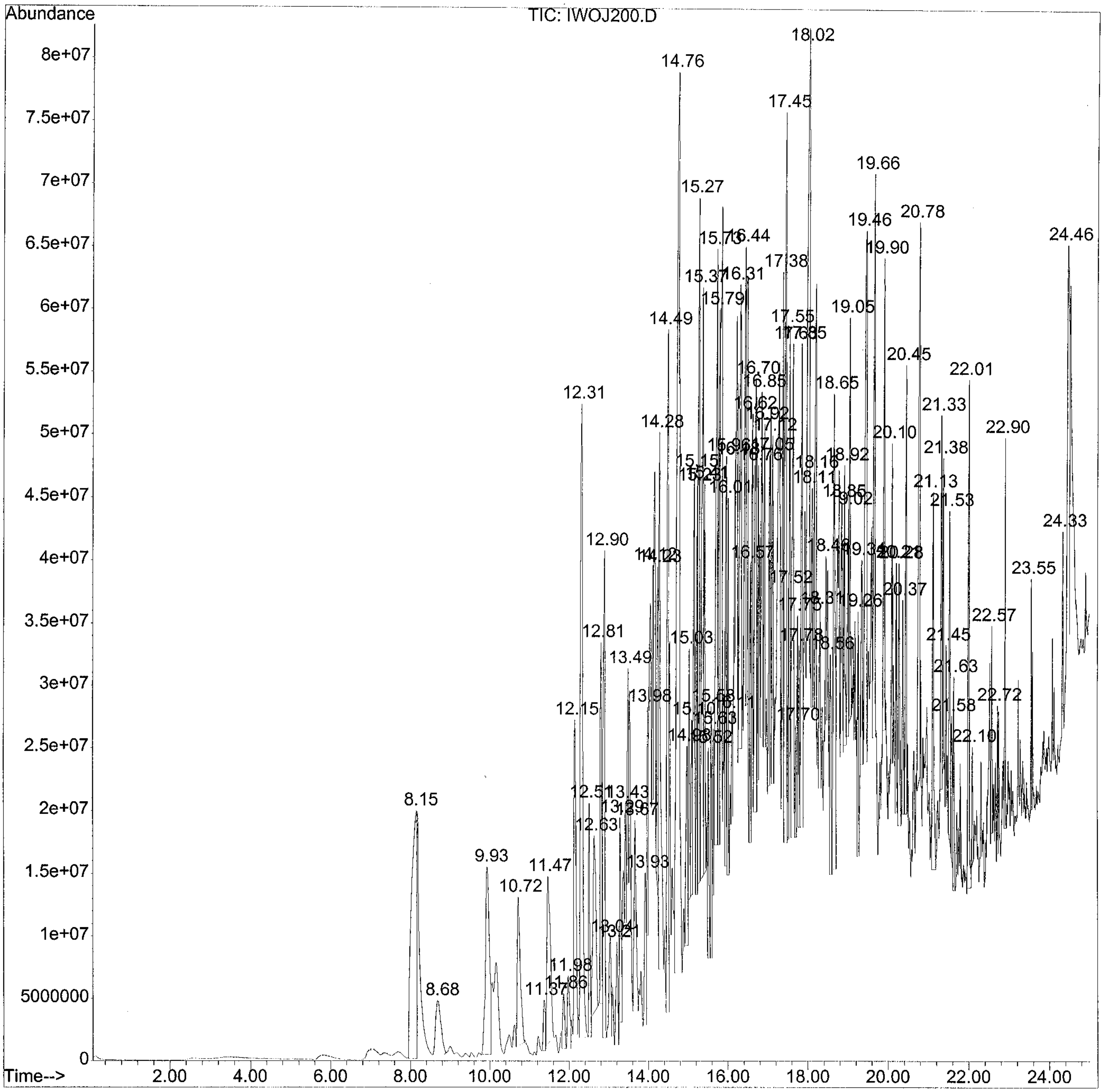
Appendix C

Example Data for GC-MSD of One Sampler

Library Search Report

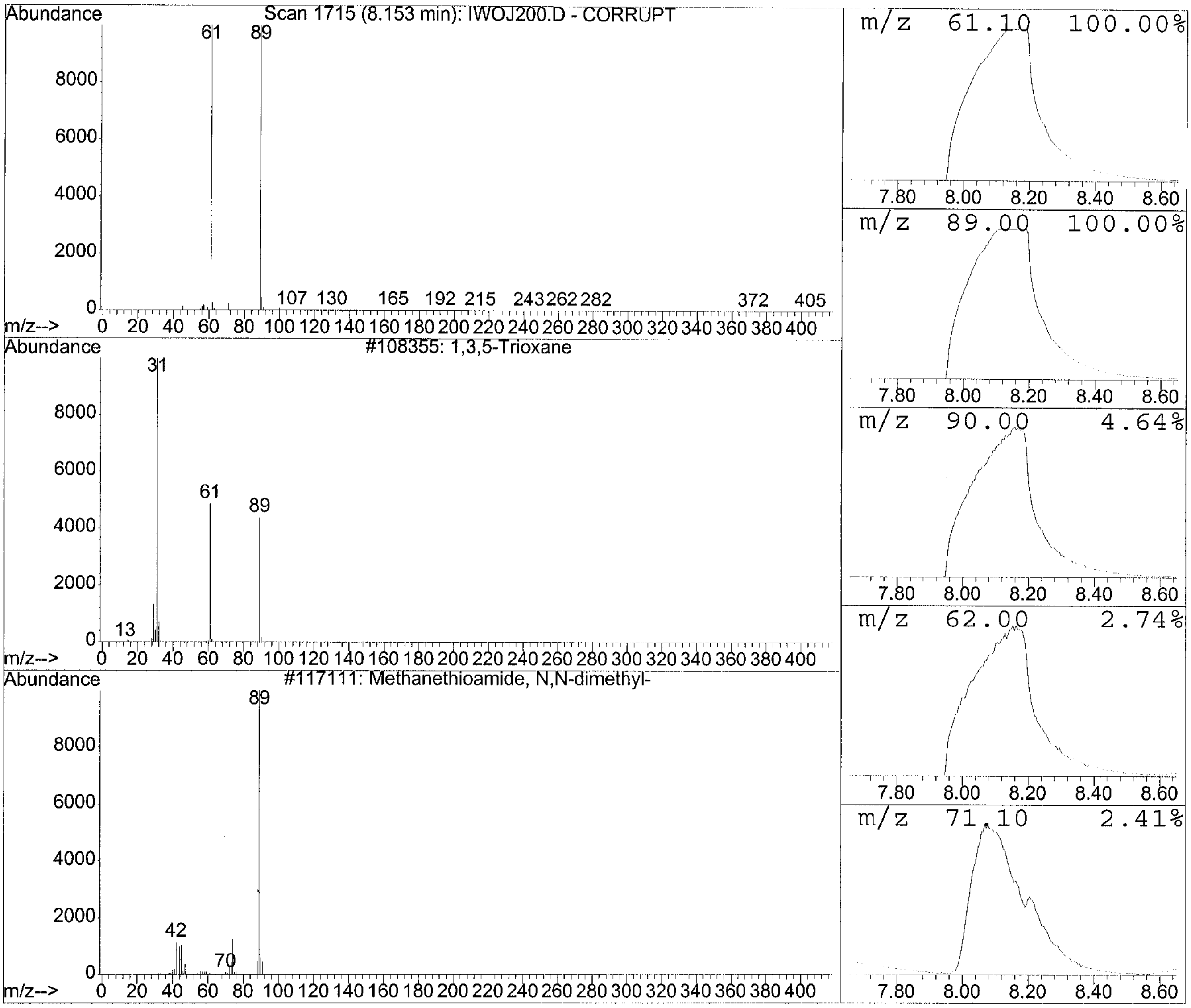
Data File : E:\!SKC24\IWOJ200.D
Acq On : 19 Sep 2001 1:06 pm
Sample : SKC 40
Misc : 24 HR
MS Integration Params: rteint.p
Method : C:\HPCHEM\1\METHODS\SPME_ALL.M (RTE Integrator)
Title : SPME ALL

Vial: 23
Operator: FRM
Inst : Orange
Multiplr: 1.00



Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

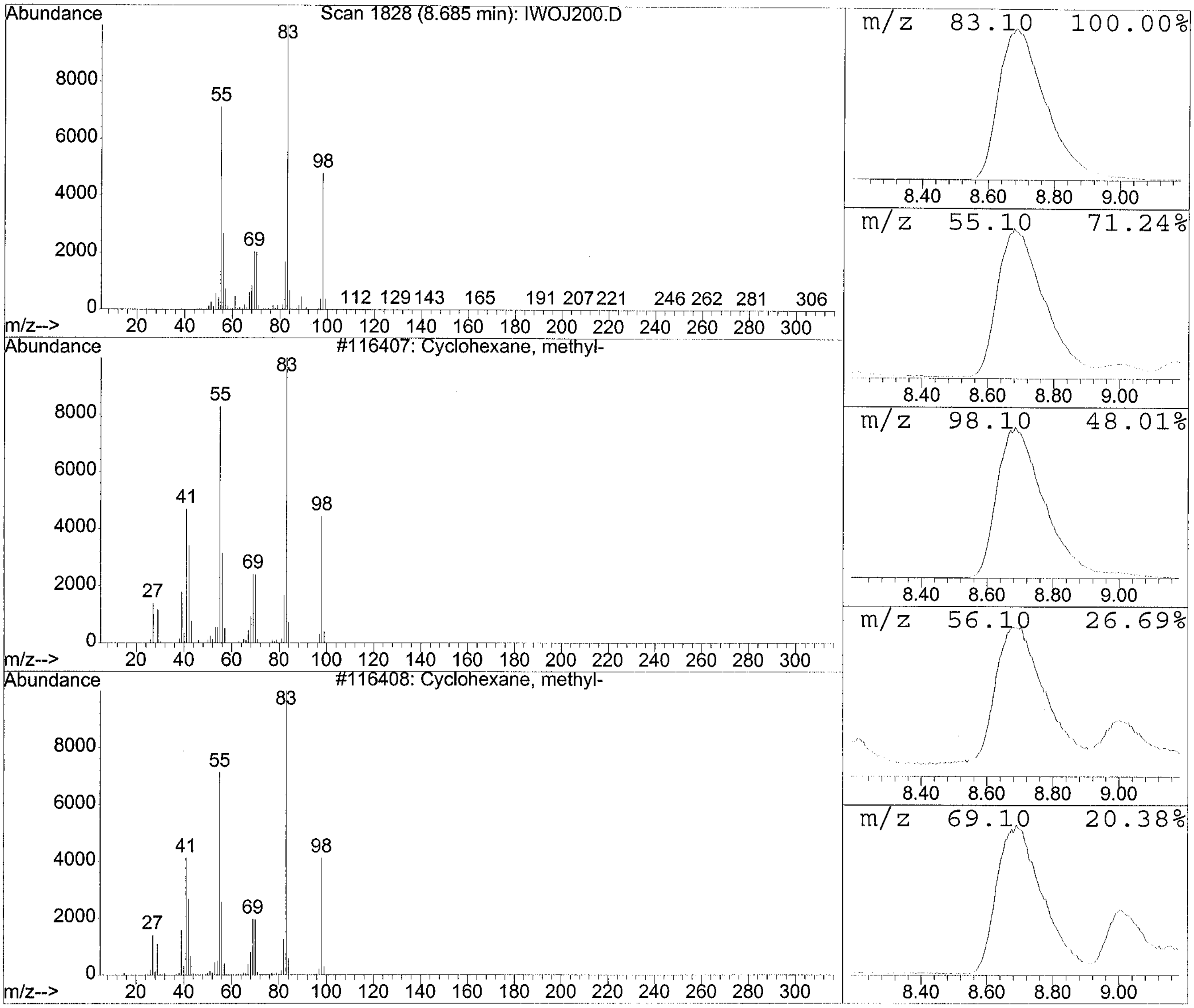


Peak Number: 1 at 8.15 min Area: 186893919 Area % 2.88

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1,3,5-Trioxane	108355	000110-88-3	83
2 Methanethioamide, N,N-dimethyl-	117111	000758-16-7	7

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

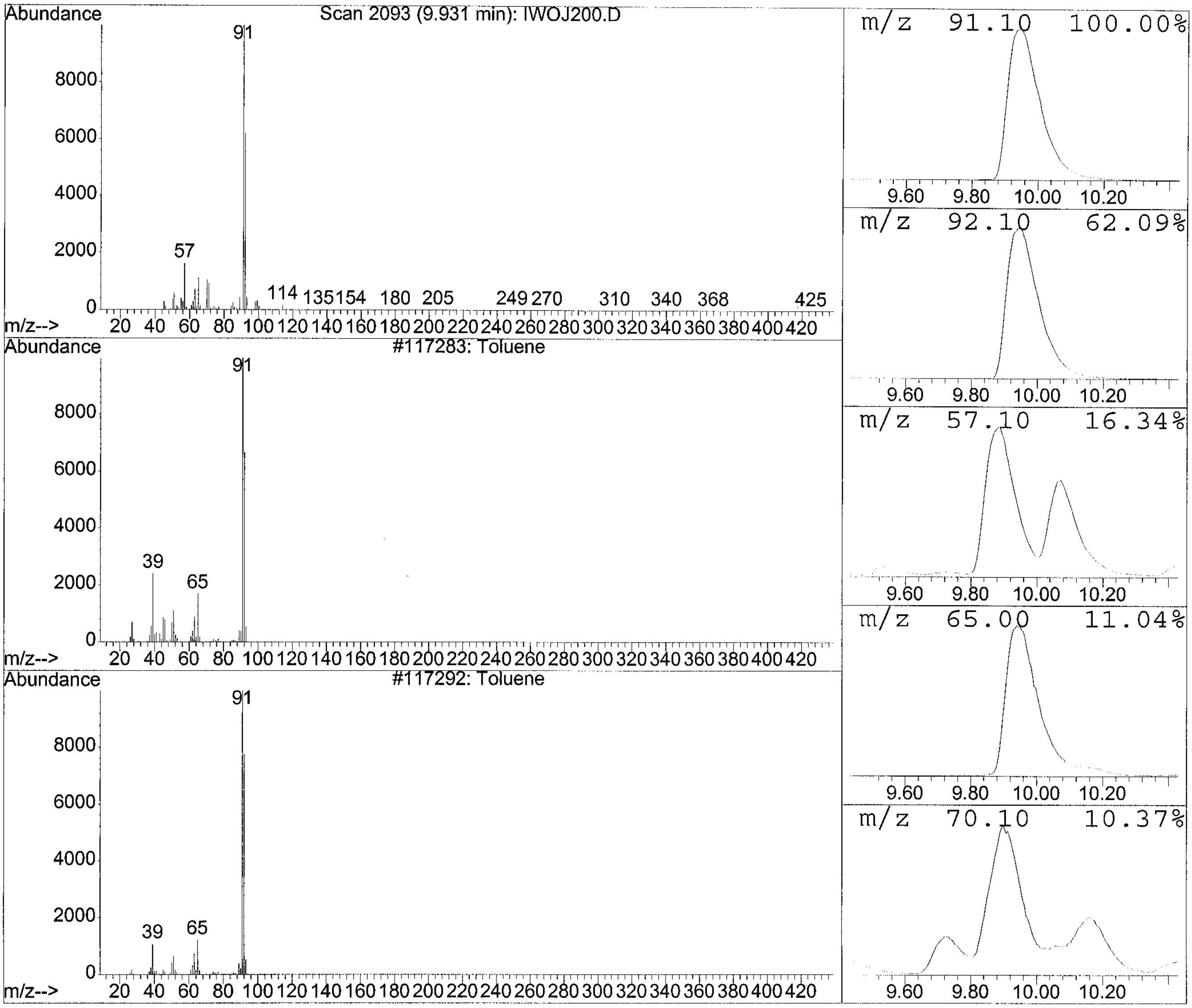


Peak Number: 2 at 8.68 min Area: 40101428 Area % 0.62

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, methyl-	116407	000108-87-2	95
2 Cyclohexane, methyl-	116408	000108-87-2	95

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

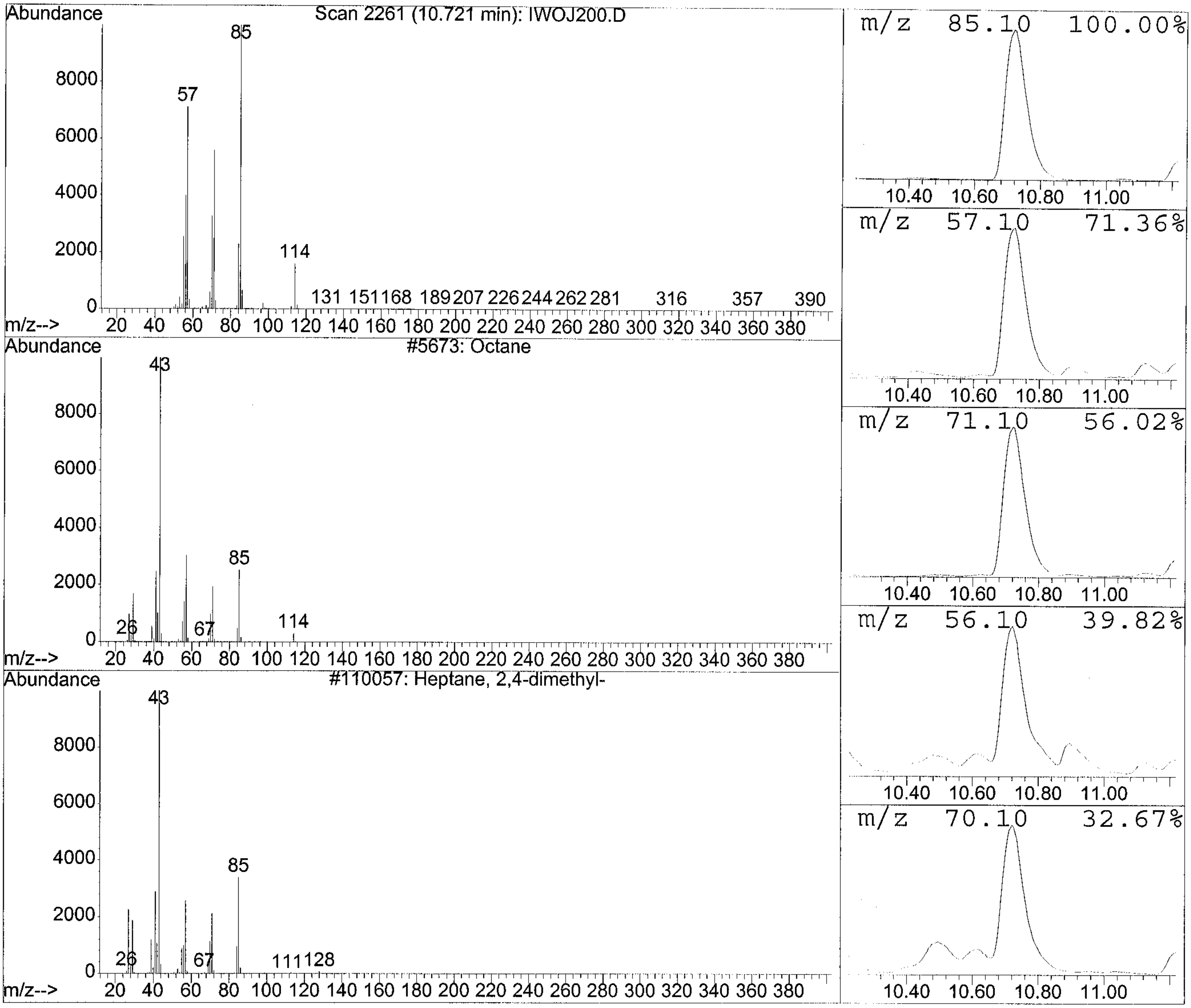


Peak Number: 3 at 9.93 min Area: 106348453 Area % 1.64

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Toluene	117283	000108-88-3	64
2 Toluene	117292	000108-88-3	64

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

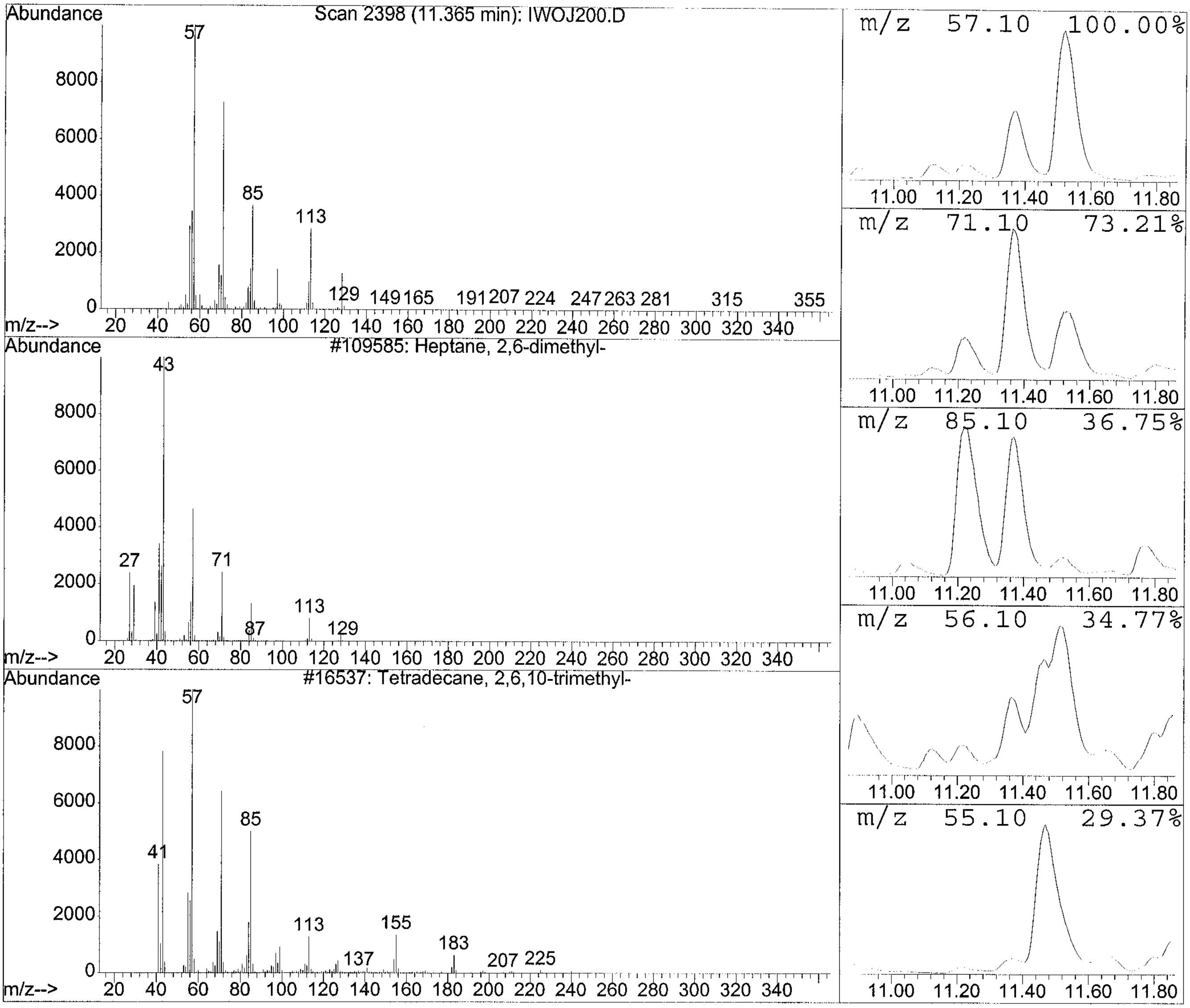


Peak Number: 4 at 10.72 min Area: 63770933 Area % 0.98

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Octane	5673	000111-65-9	86
2 Heptane, 2,4-dimethyl-	110057	002213-23-2	72

Library Search Report - RTE Integrator

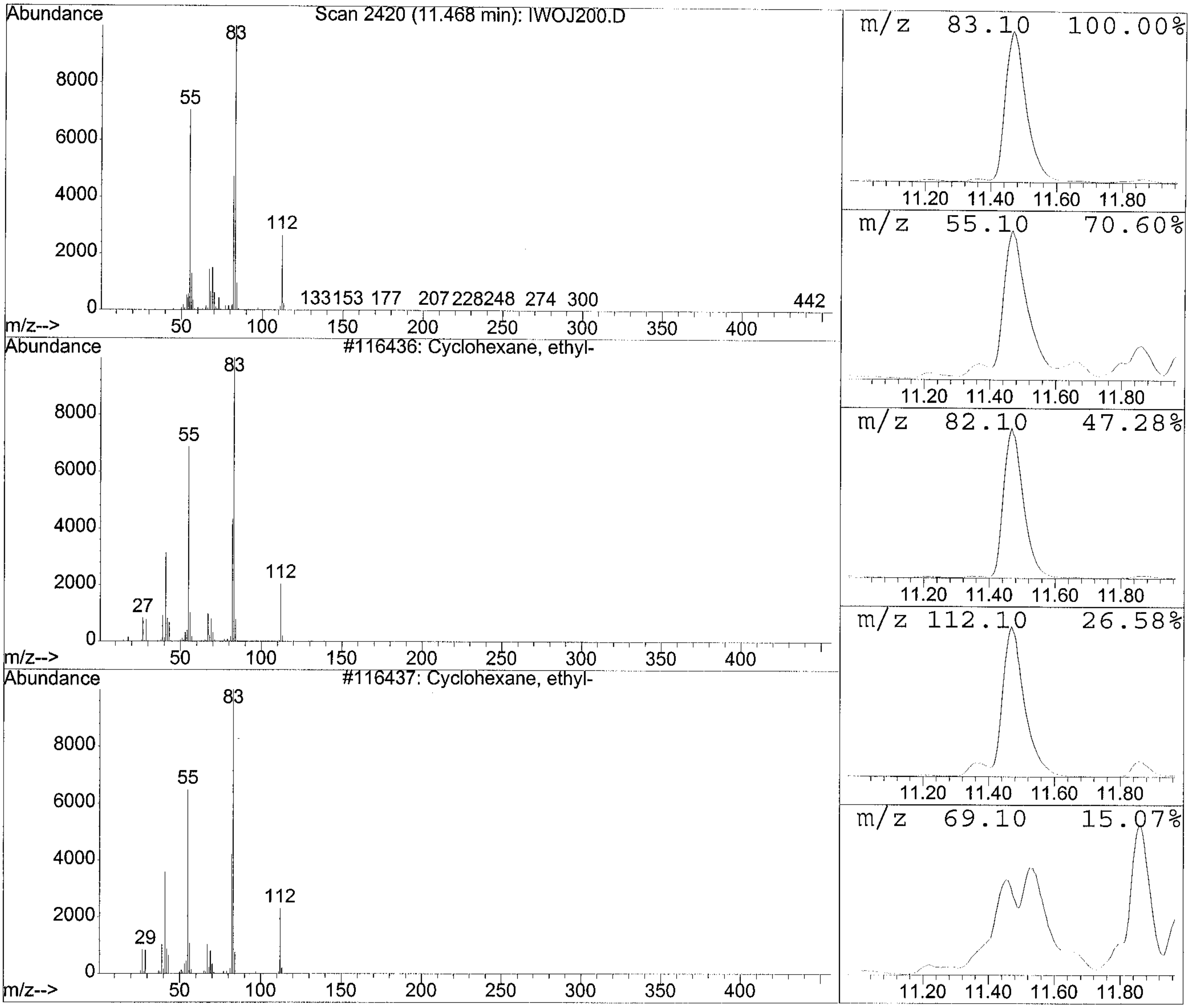
Unknown Spectrum based on Apex



Peak Number: 5 at 11.37 min Area: 14879673 Area % 0.23

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Heptane, 2,6-dimethyl-	109585	001072-05-5	80
2 Tetradecane, 2,6,10-trimethyl-	16537	014905-56-7	72

Unknown Spectrum based on Apex

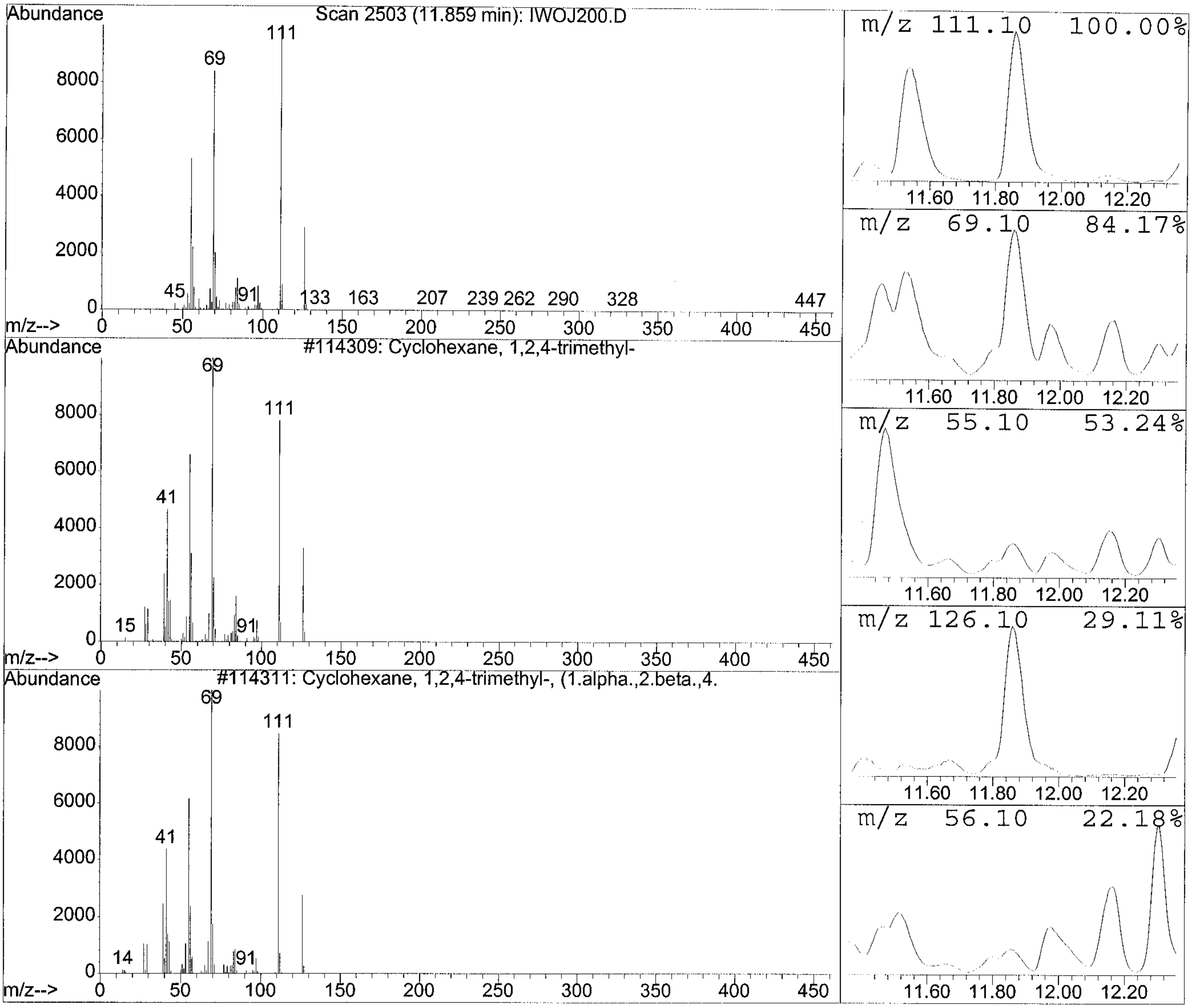


Peak Number: 6 at 11.47 min Area: 81270509 Area % 1.25

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, ethyl-	116436	001678-91-7	91
2 Cyclohexane, ethyl-	116437	001678-91-7	91

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

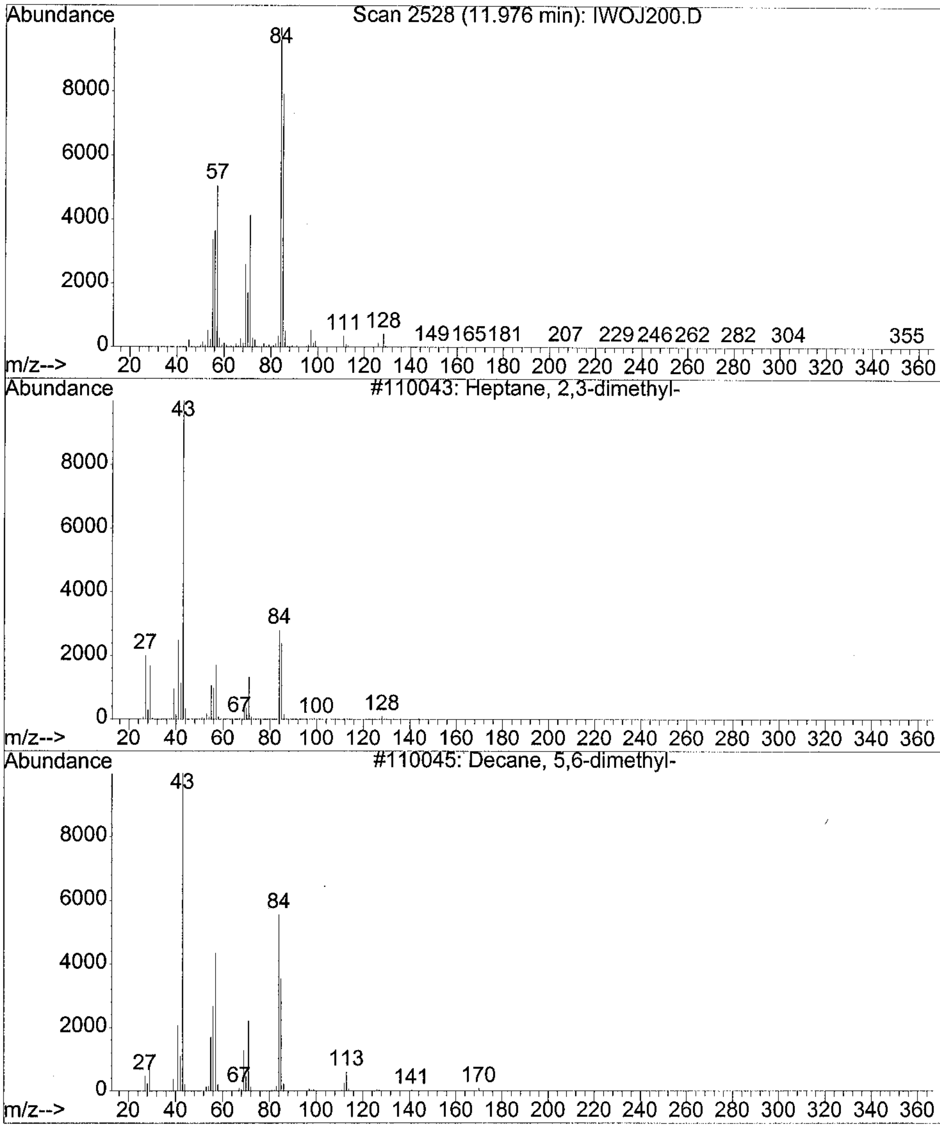


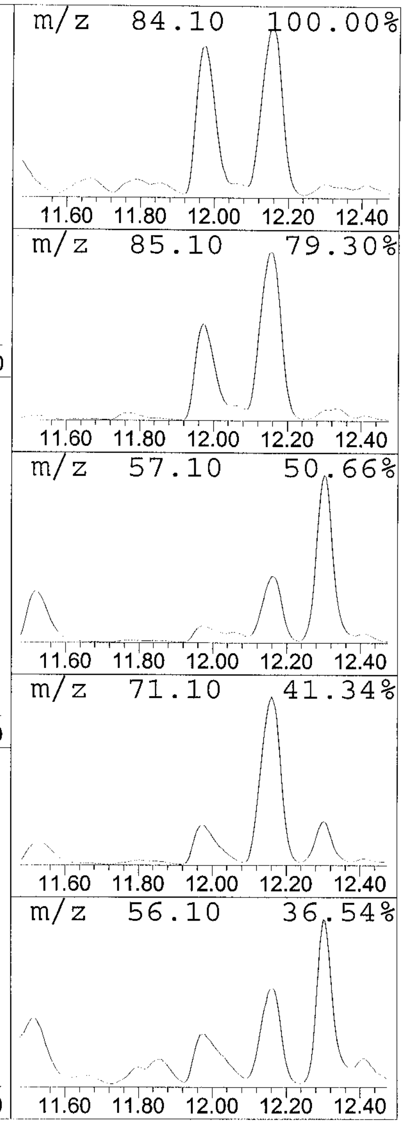
Peak Number: 7 at 11.86 min Area: 15750981 Area % 0.24

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, 1,2,4-trimethyl-	114309	002234-75-5	93
2 Cyclohexane, 1,2,4-trimethyl-, (1.a	114311	007667-60-9	91

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



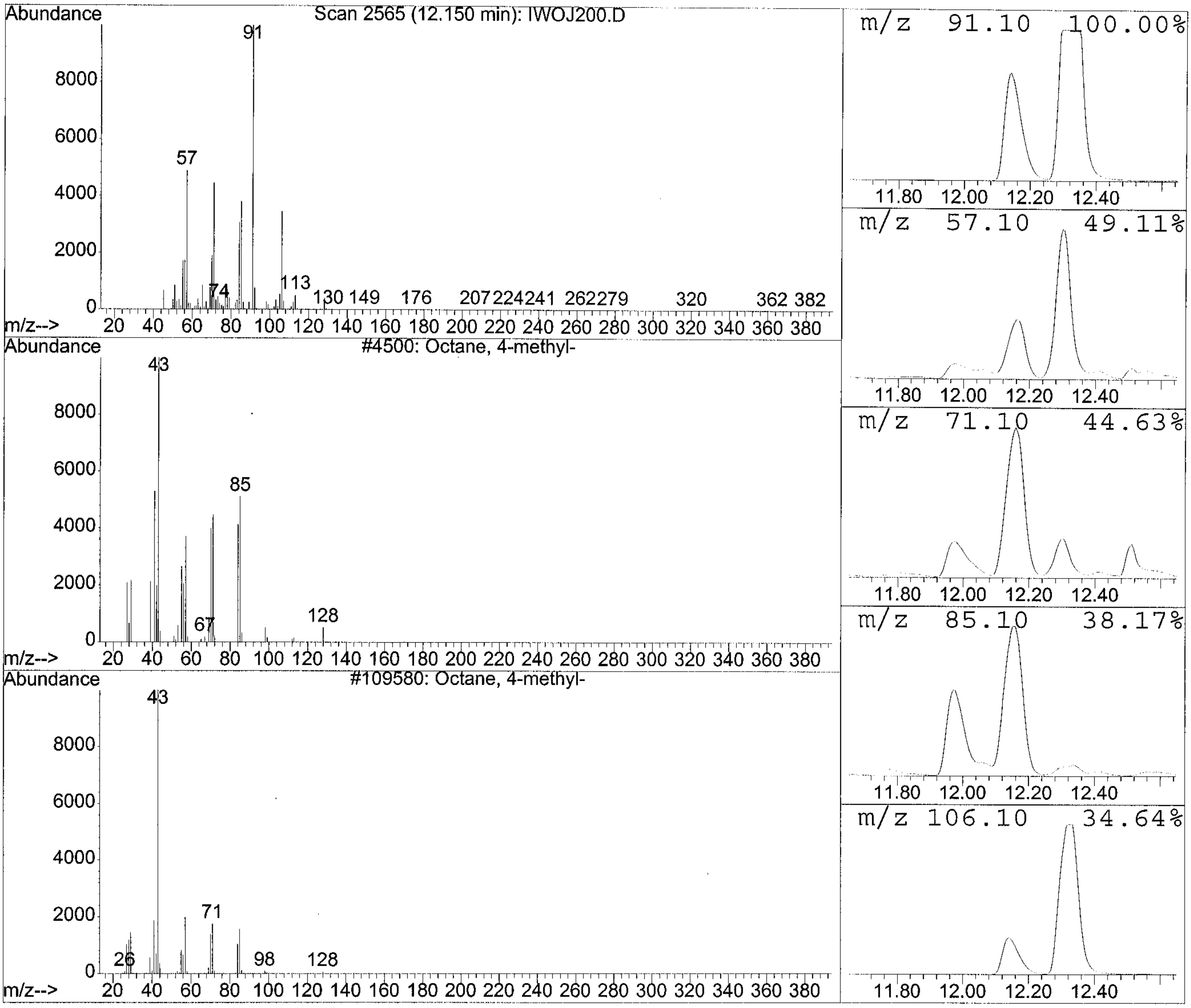


Peak Number: 8 at 11.98 min Area: 24516802 Area % 0.38

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Heptane, 2,3-dimethyl-	110043	003074-71-3	90
2 Decane, 5,6-dimethyl-	110045	001636-43-7	74

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

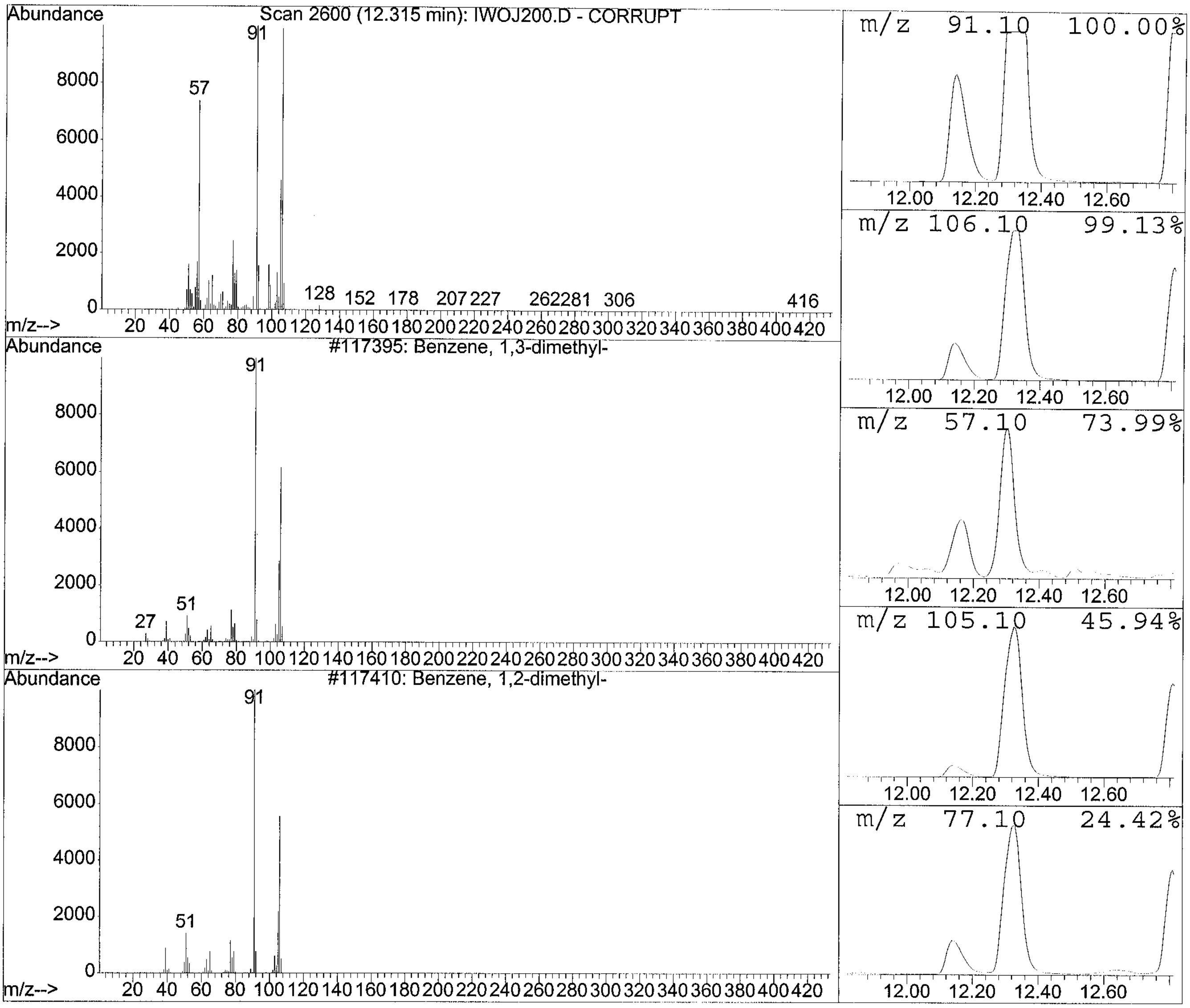


Peak Number: 9 at 12.15 min Area: 95094363 Area % 1.47

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Octane, 4-methyl-	4500	002216-34-4	52
2 Octane, 4-methyl-	109580	002216-34-4	47

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

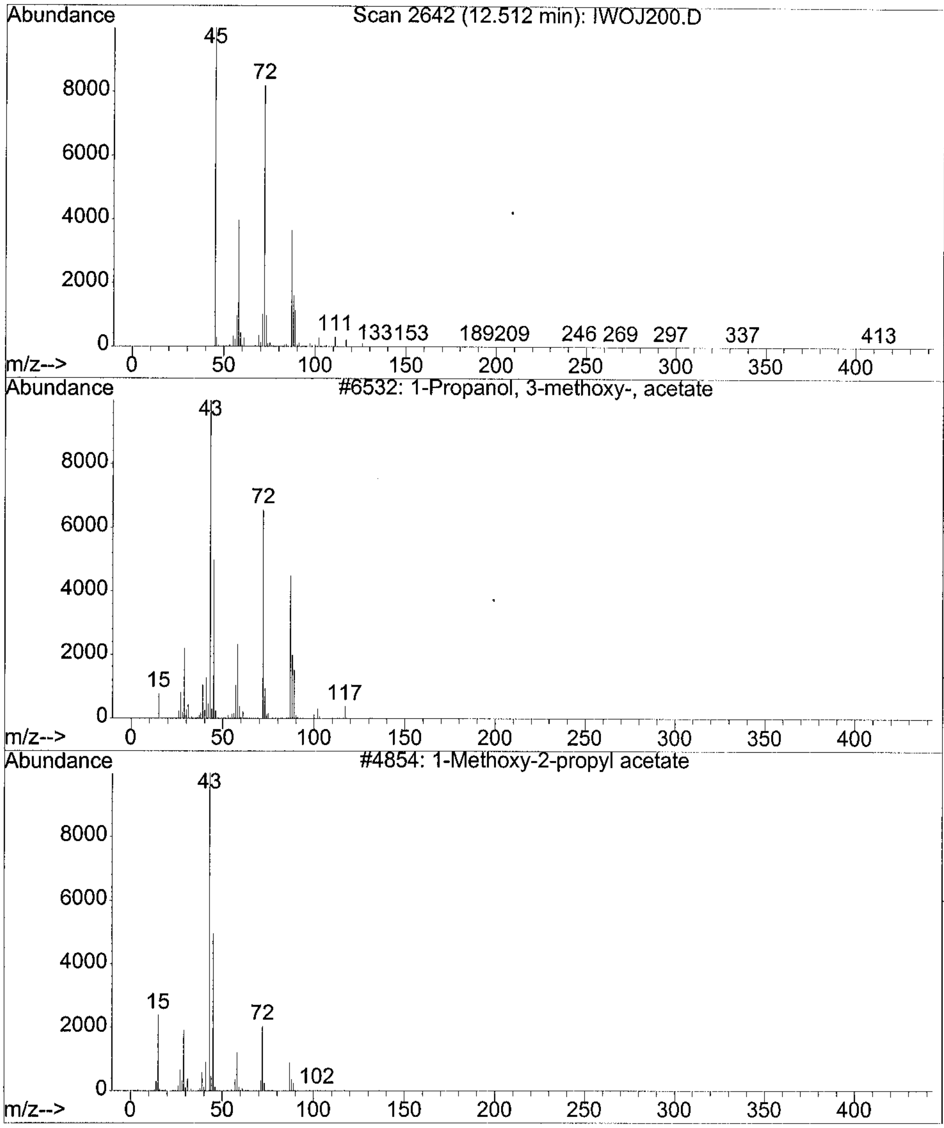


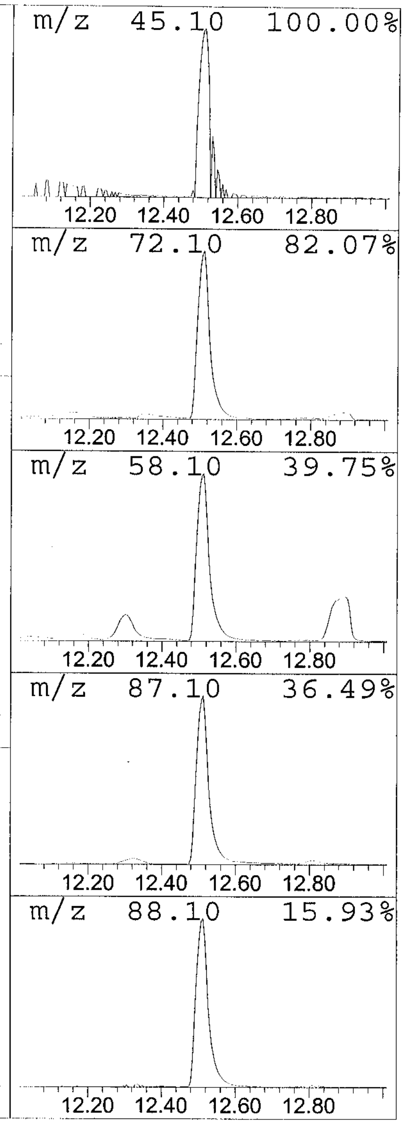
Peak Number: 10 at 12.31 min Area: 212108718 Area % 3.27

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,3-dimethyl-	117395	000108-38-3	89
2 Benzene, 1,2-dimethyl-	117410	000095-47-6	89

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



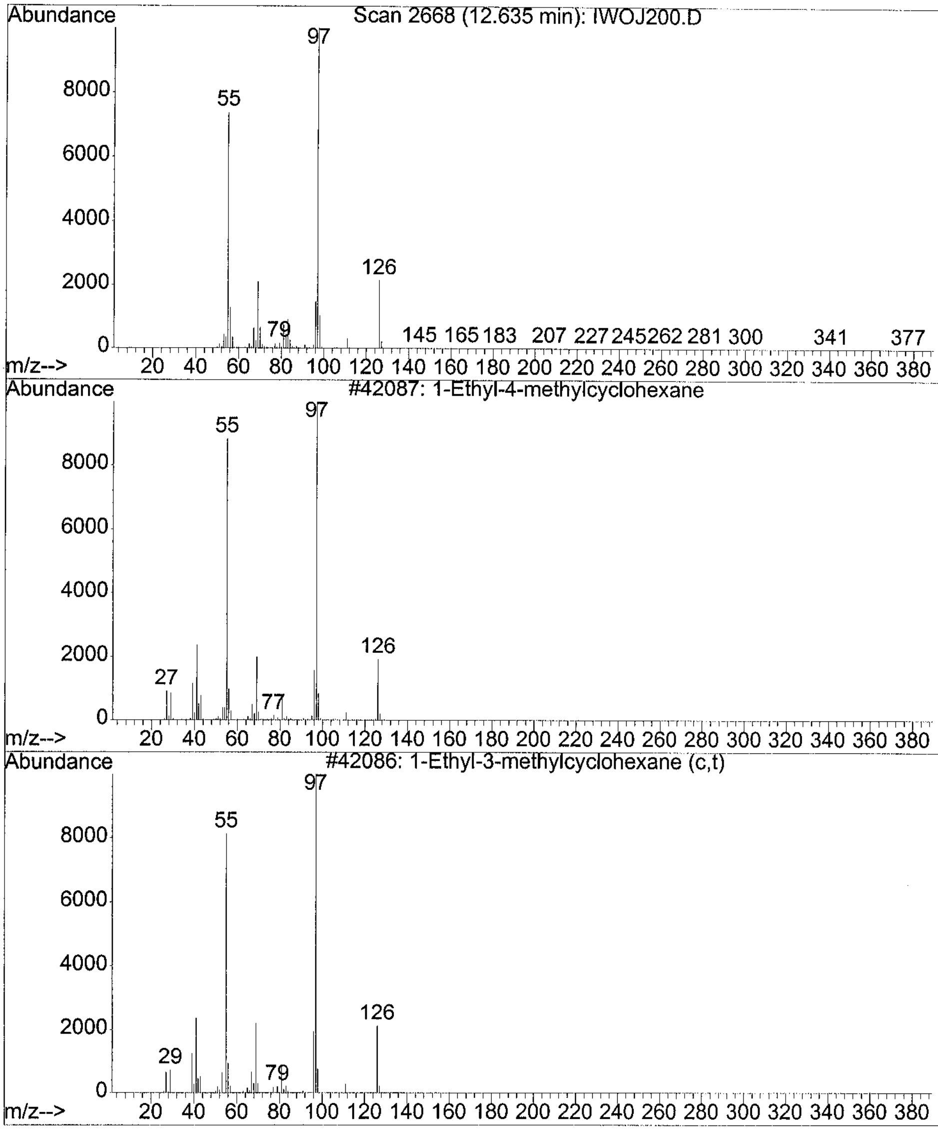


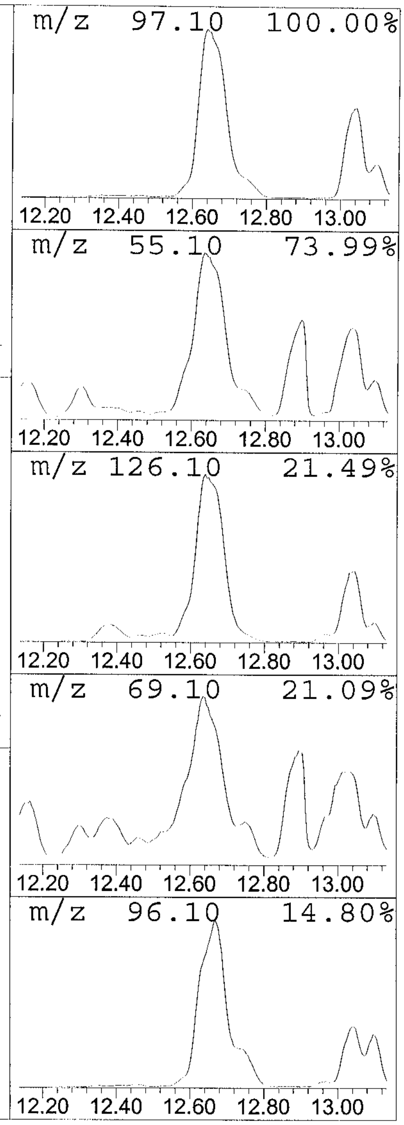
Peak Number: 11 at 12.51 min Area: 42191614 Area % 0.65

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Propanol, 3-methoxy-, acetate	6532	1000142-84-6	50
2 1-Methoxy-2-propyl acetate	4854	000108-65-6	38

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



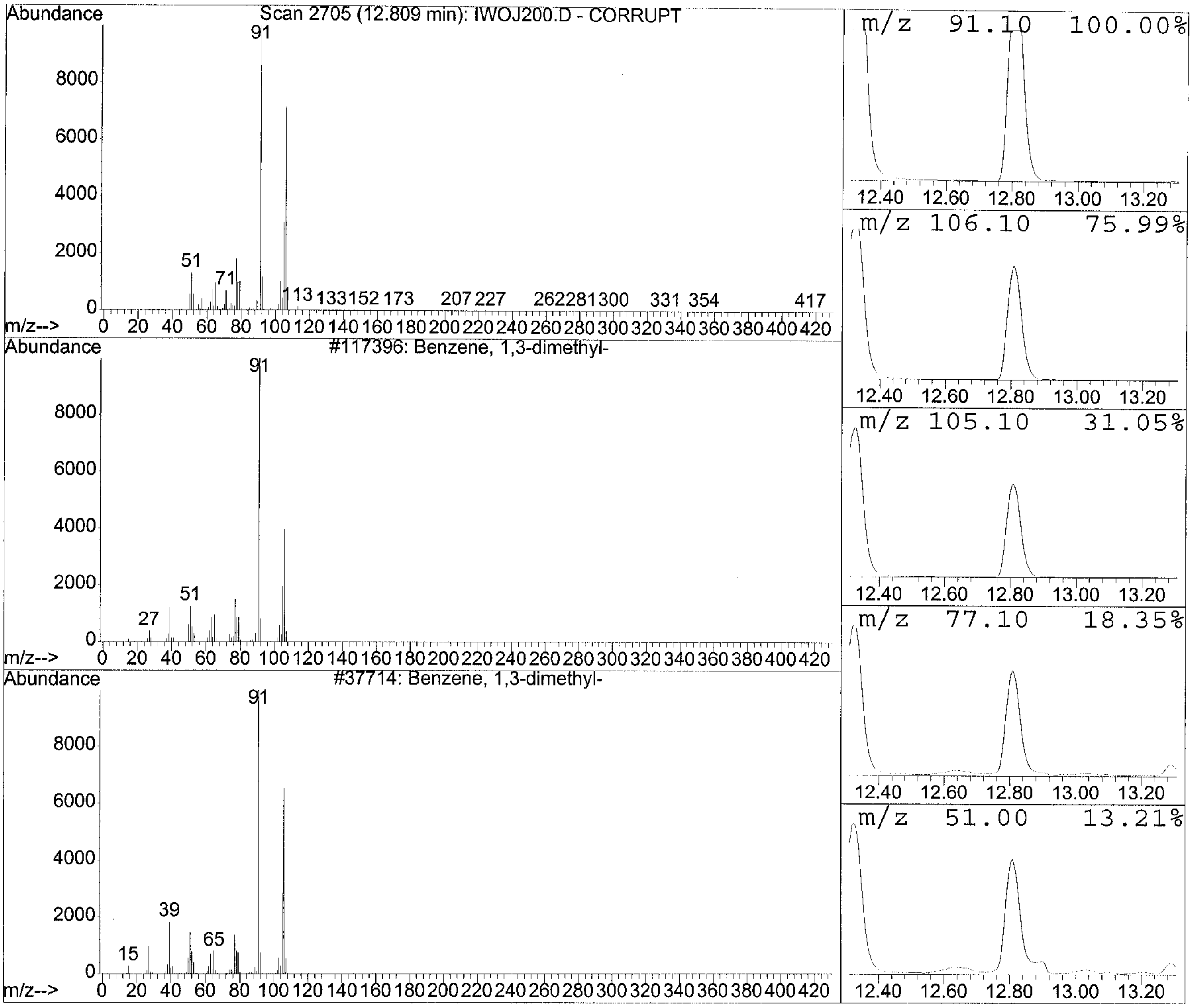


Peak Number: 12 at 12.63 min Area: 74082245 Area % 1.14

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Ethyl-4-methylcyclohexane	42087	003728-56-1	93
2 1-Ethyl-3-methylcyclohexane (c,t)	42086	003728-55-0	91

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

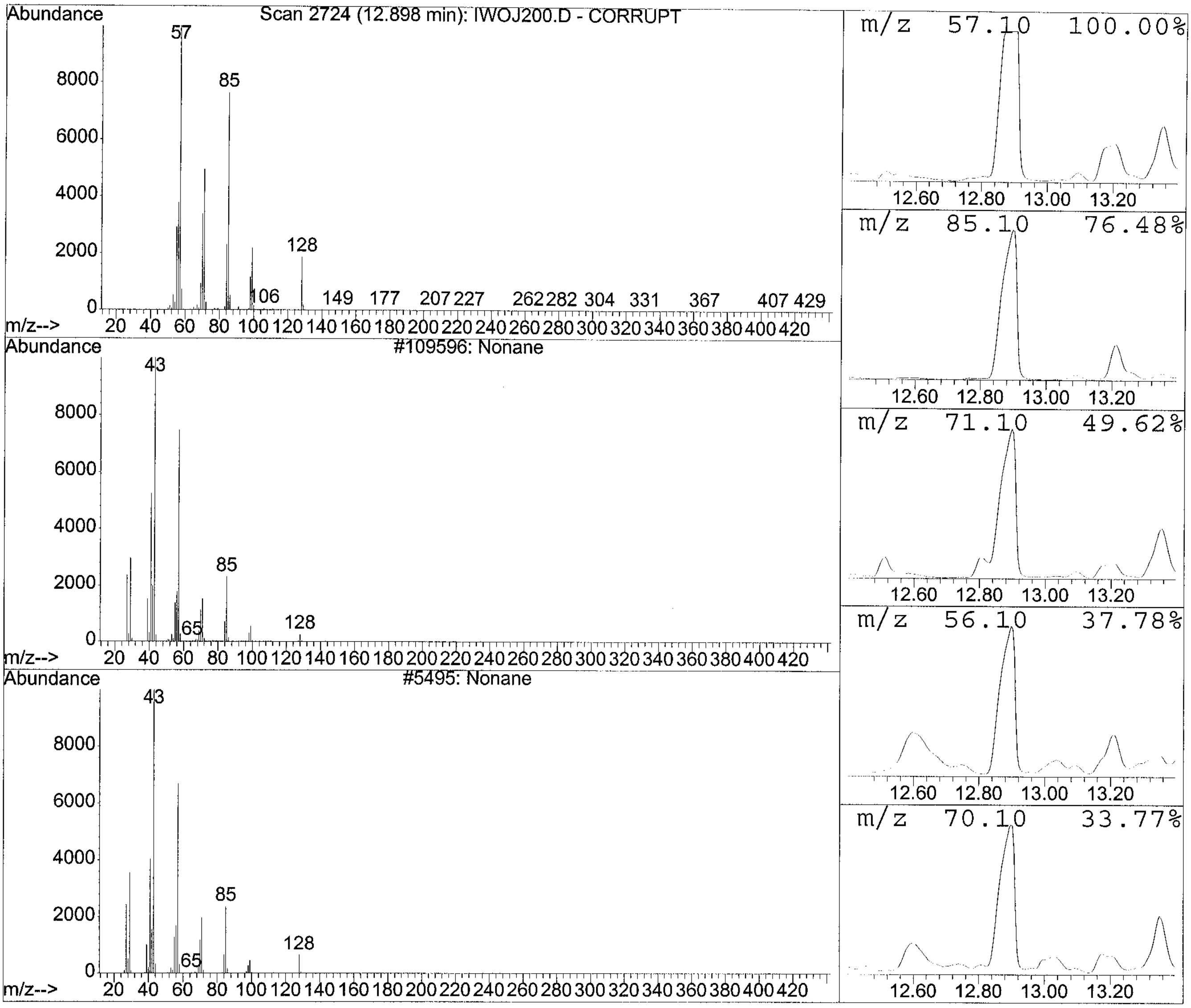


Peak Number: 13 at 12.81 min Area: 81162212 Area % 1.25

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,3-dimethyl-	117396	000108-38-3	96
2 Benzene, 1,3-dimethyl-	37714	000108-38-3	95

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

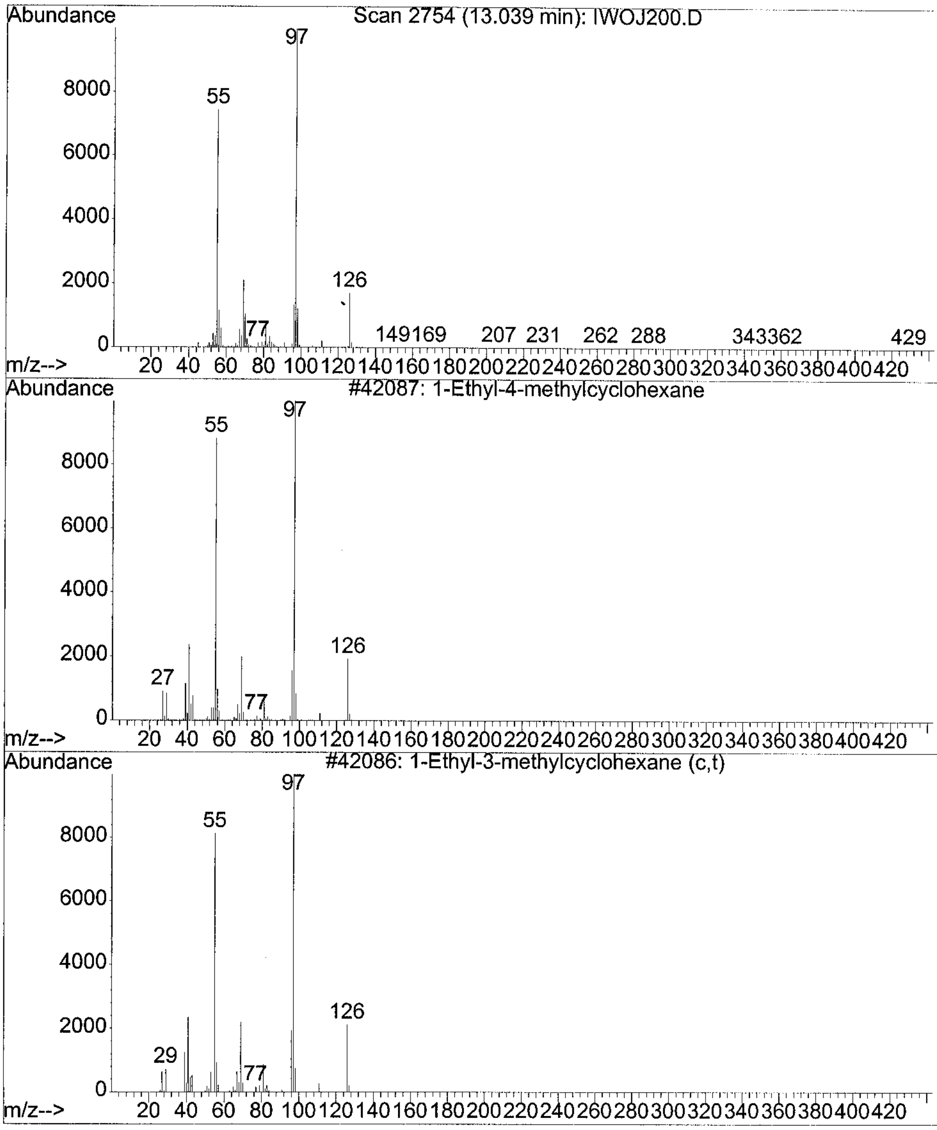


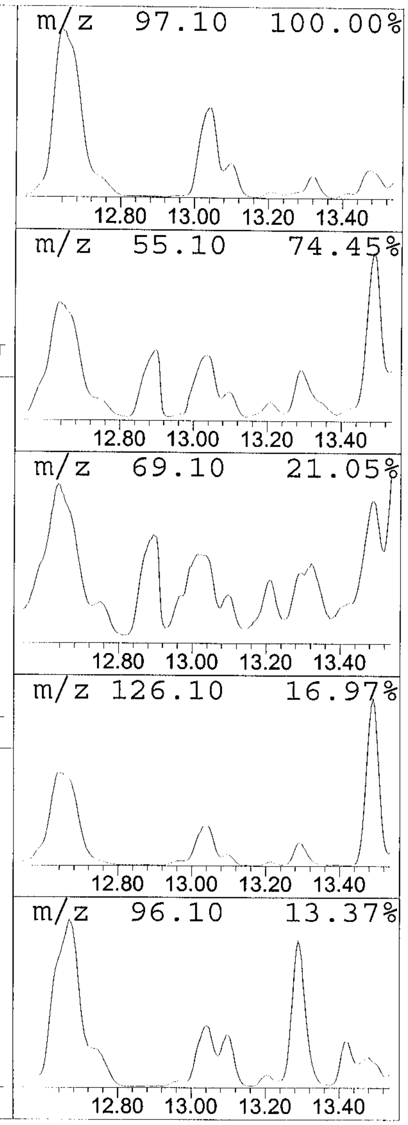
Peak Number: 14 at 12.90 min Area: 120560210 Area % 1.86

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Nonane	109596	000111-84-2	83
2 Nonane	5495	000111-84-2	72

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



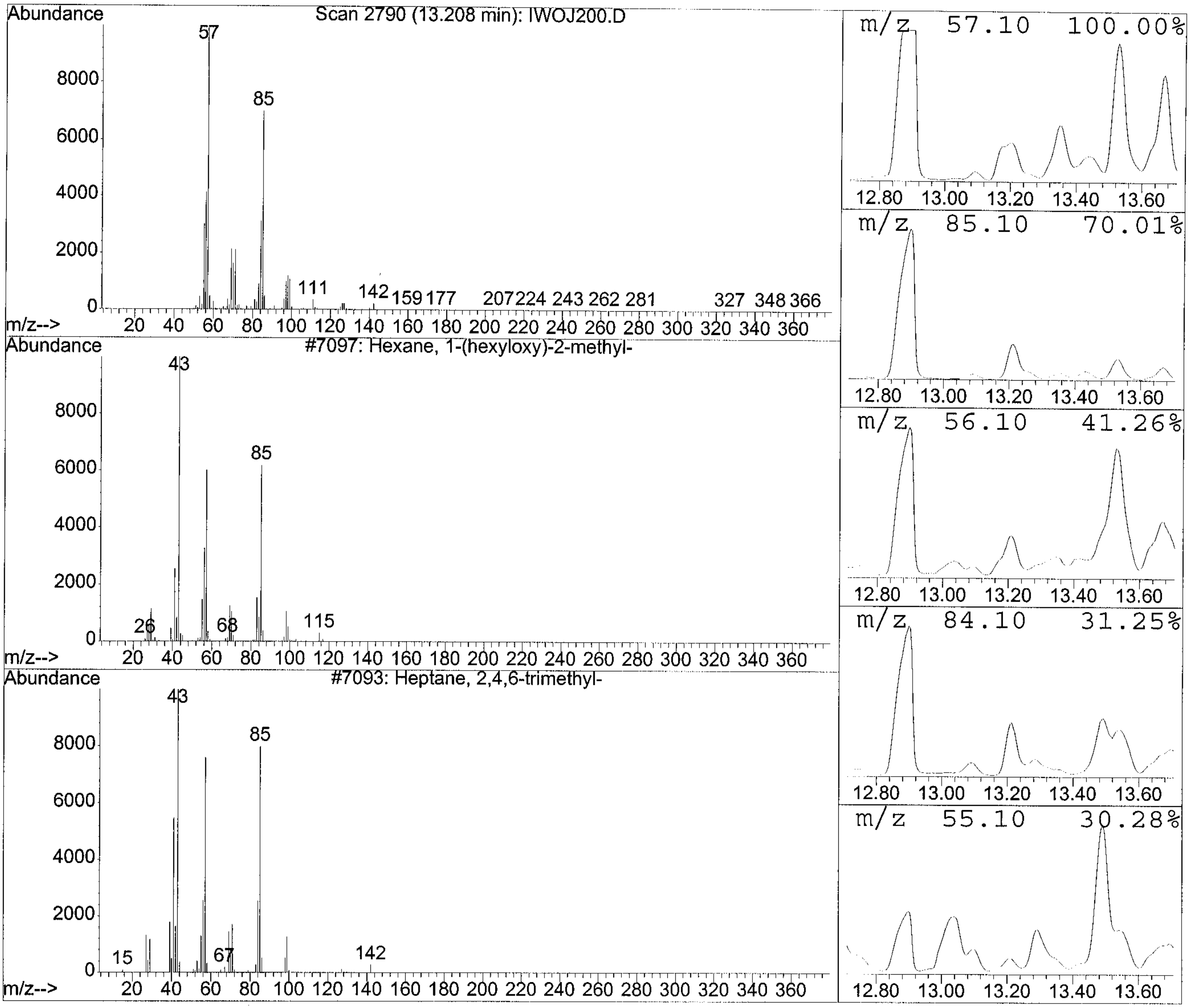


Peak Number: 15 at 13.04 min Area: 29759827 Area % 0.46

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Ethyl-4-methylcyclohexane	42087	003728-56-1	94
2 1-Ethyl-3-methylcyclohexane (c,t)	42086	003728-55-0	87

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

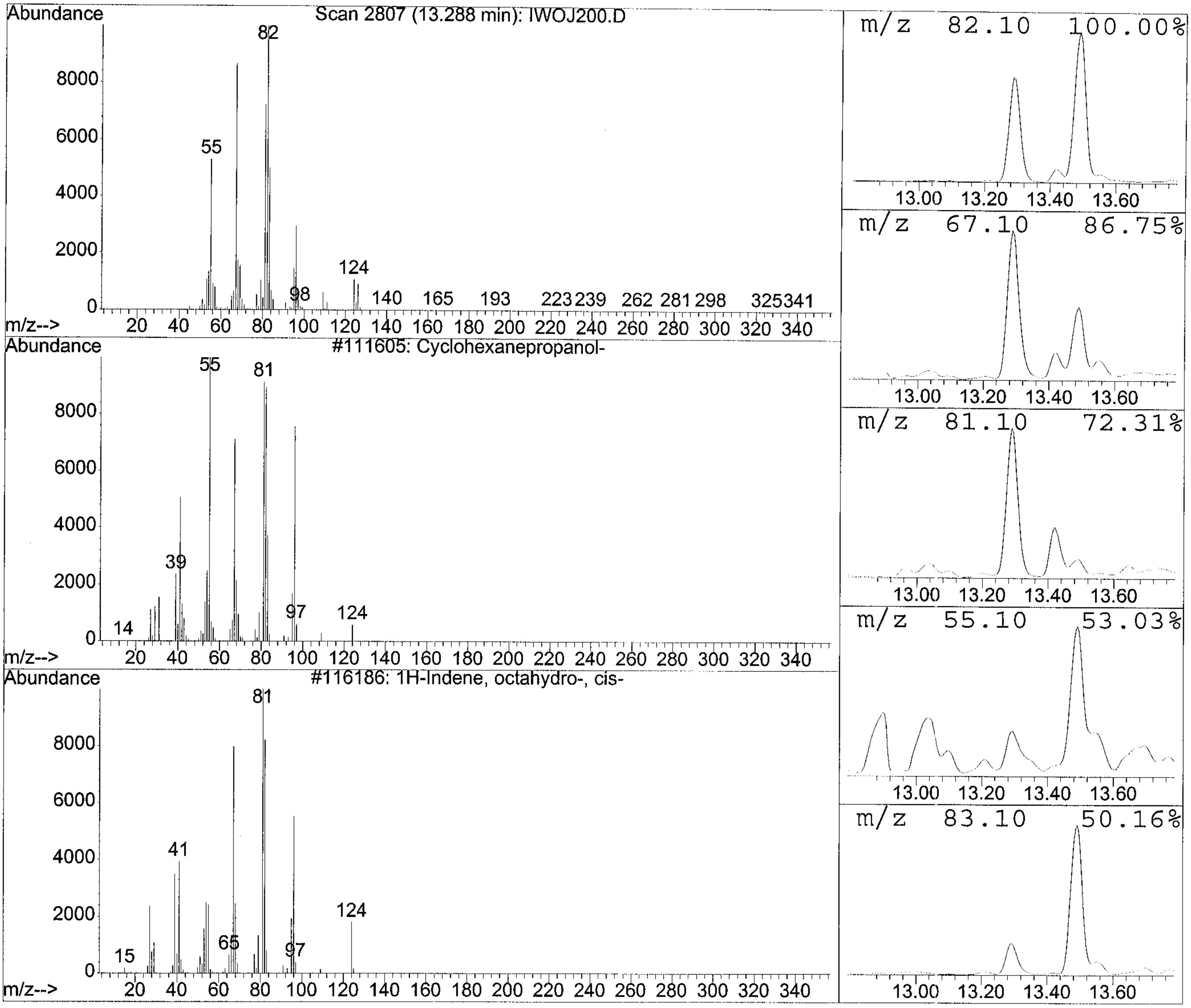


Peak Number: 16 at 13.21 min Area: 27046675 Area % 0.42

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Hexane, 1-(hexyloxy)-2-methyl-	7097	074421-17-3	59
2 Heptane, 2,4,6-trimethyl-	7093	002613-61-8	58

Library Search Report - RTE Integrator

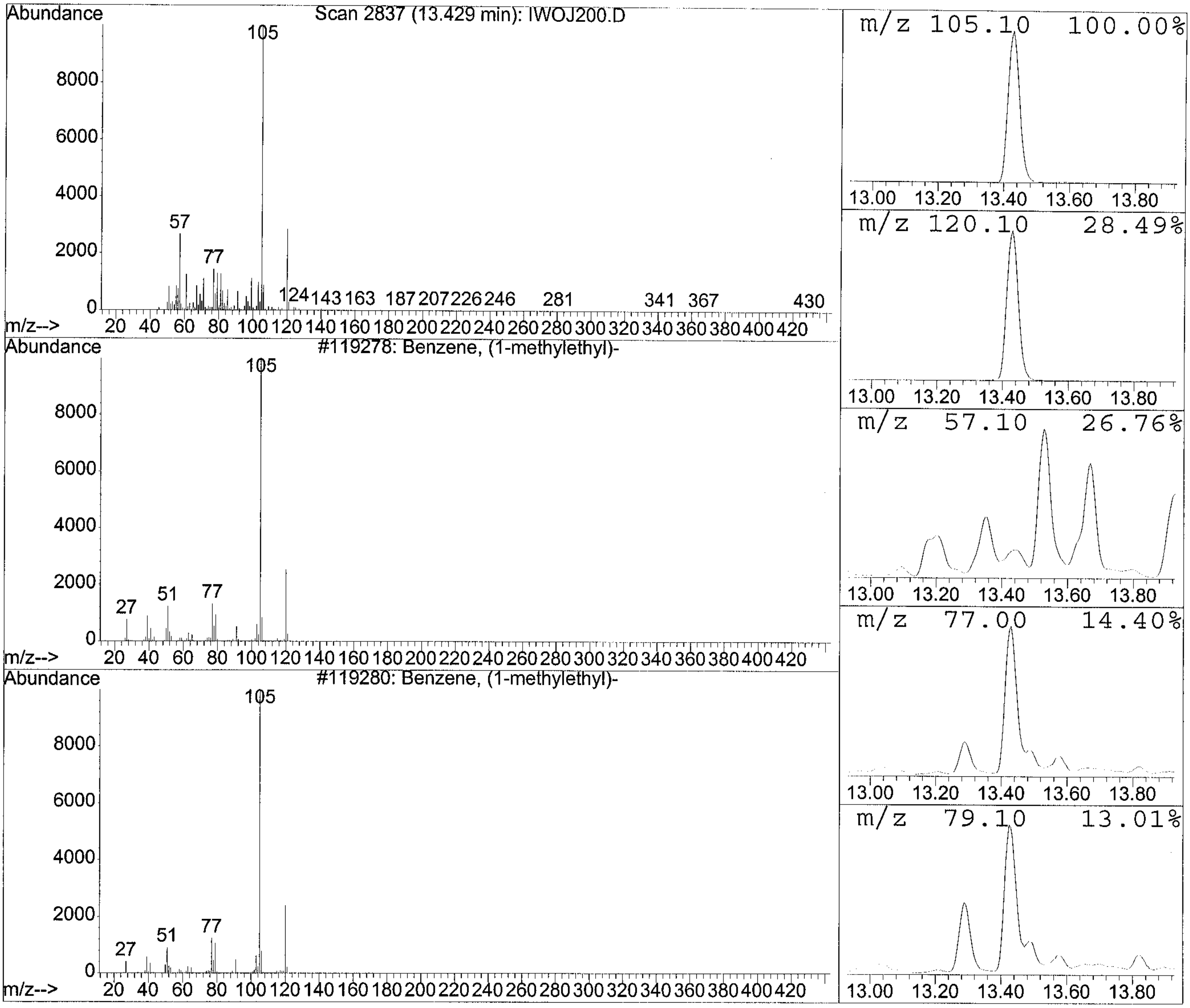
Unknown Spectrum based on Apex



Peak Number: 17 at 13.29 min Area: 44712324 Area % 0.69

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexanepropanol-	111605	001124-63-6	50
2 1H-Indene, octahydro-, cis-	116186	004551-51-3	46

Unknown Spectrum based on Apex

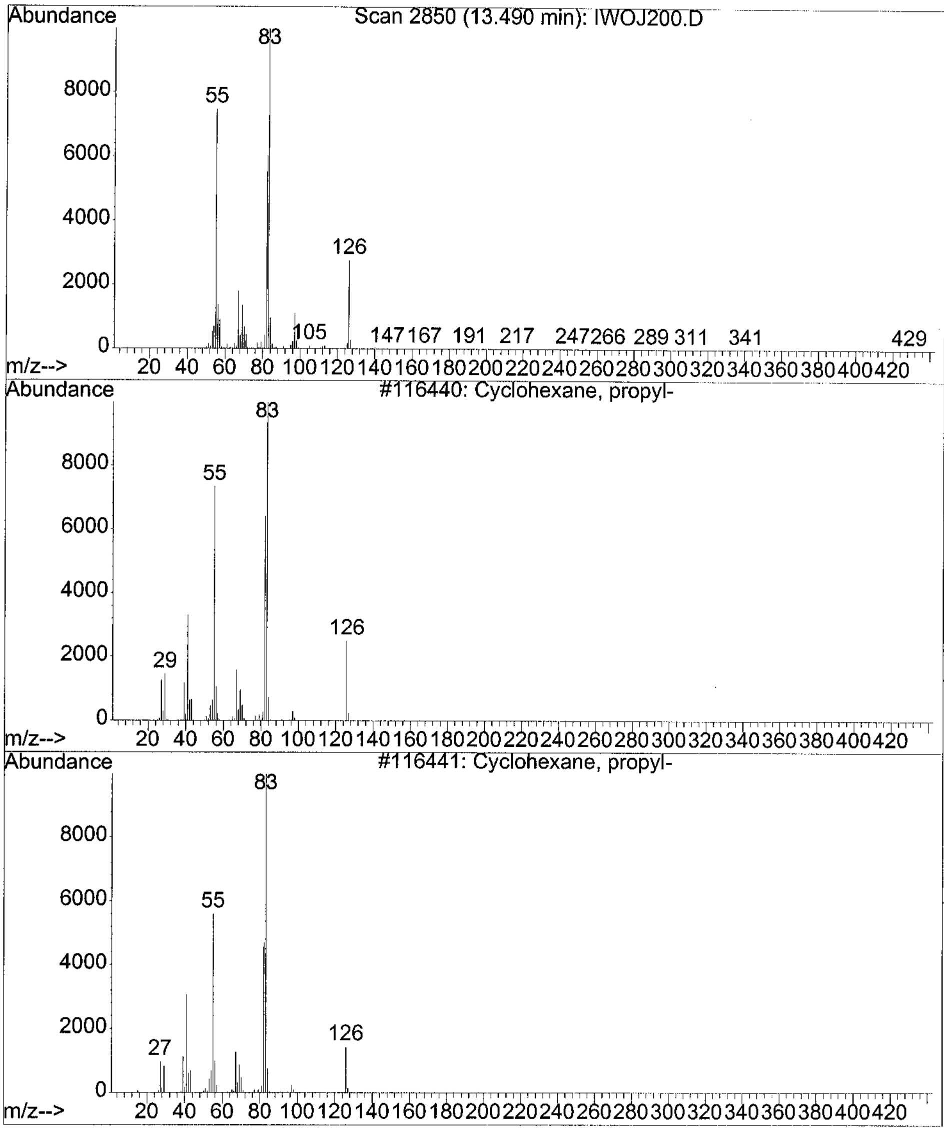


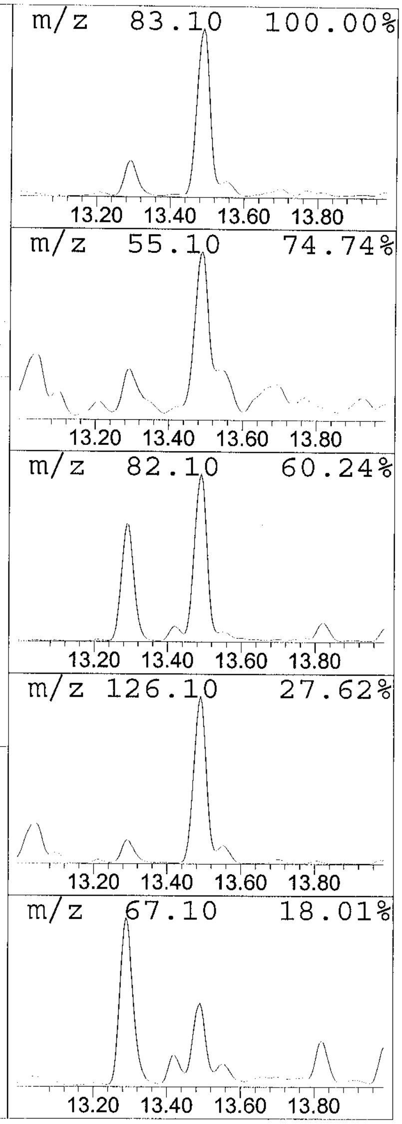
Peak Number: 18 at 13.43 min Area: 18160496 Area % 0.28

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, (1-methylethyl)-	119278	000098-82-8	60
2 Benzene, (1-methylethyl)-	119280	000098-82-8	60

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



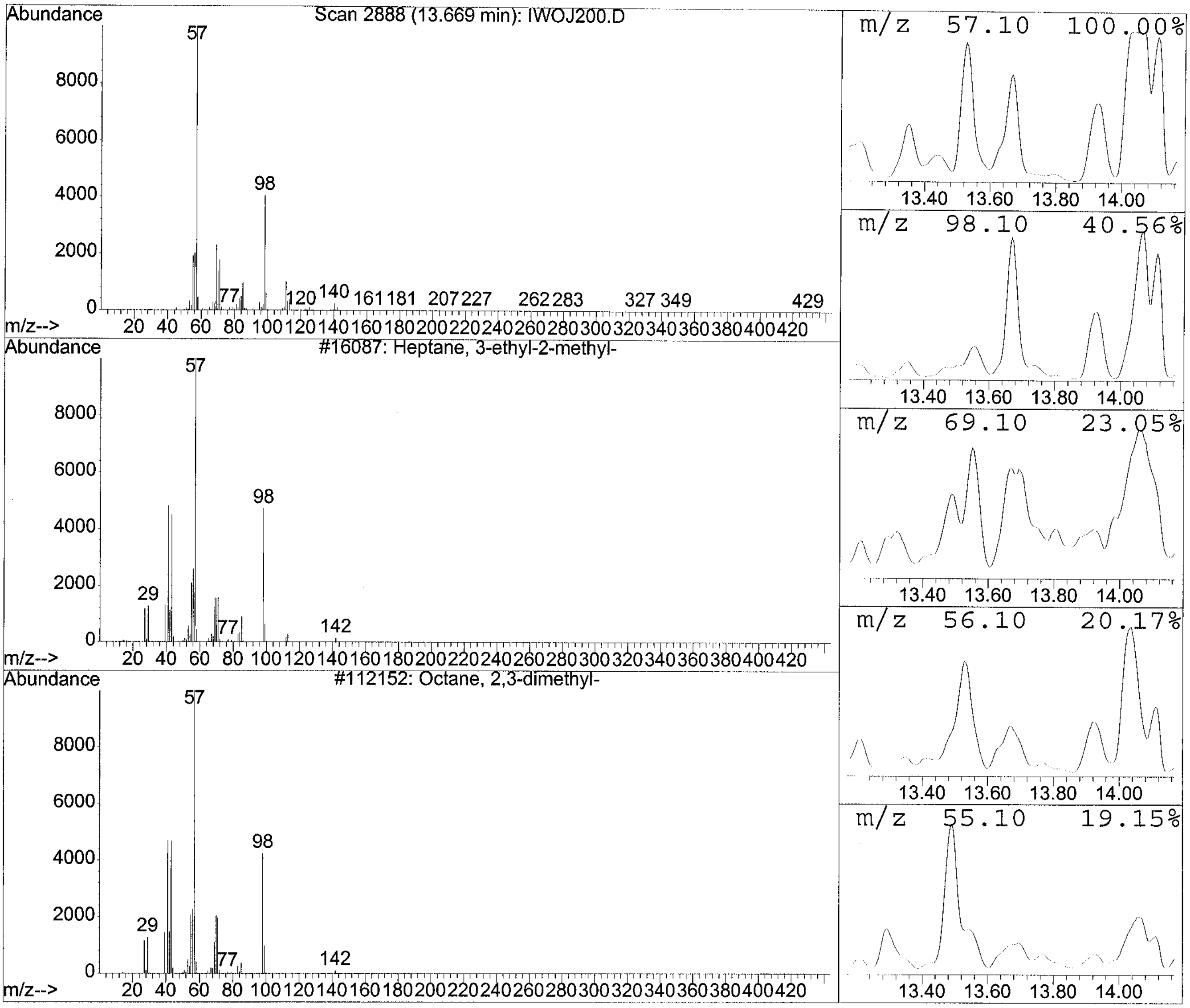


Peak Number: 19 at 13.49 min Area: 40269649 Area % 0.62

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, propyl-	116440	001678-92-8	94
2 Cyclohexane, propyl-	116441	001678-92-8	90

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

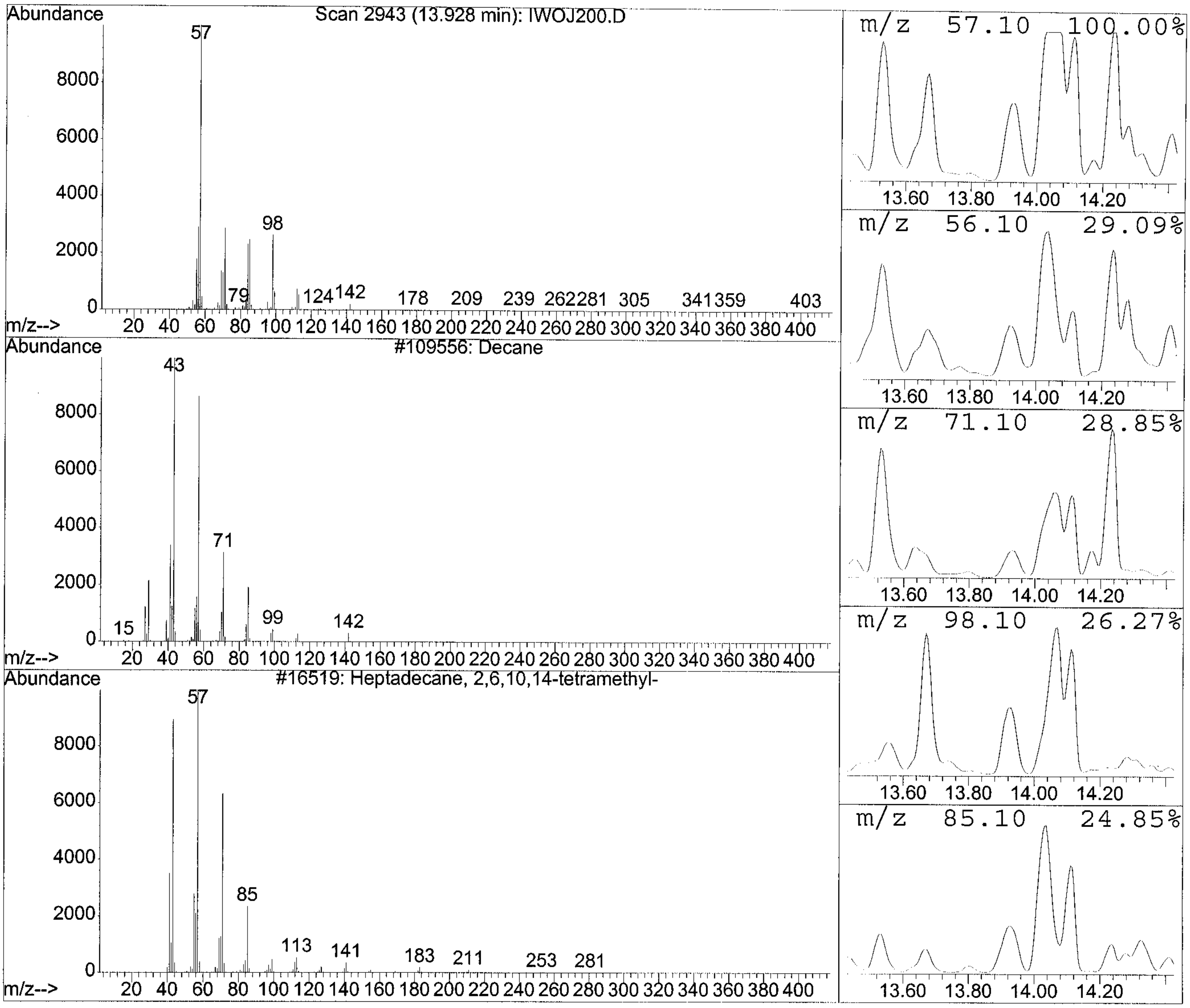


Peak Number: 20 at 13.67 min Area: 55858938 Area % 0.86

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Heptane, 3-ethyl-2-methyl-	16087	014676-29-0	90
2 Octane, 2,3-dimethyl-	112152	007146-60-3	70

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

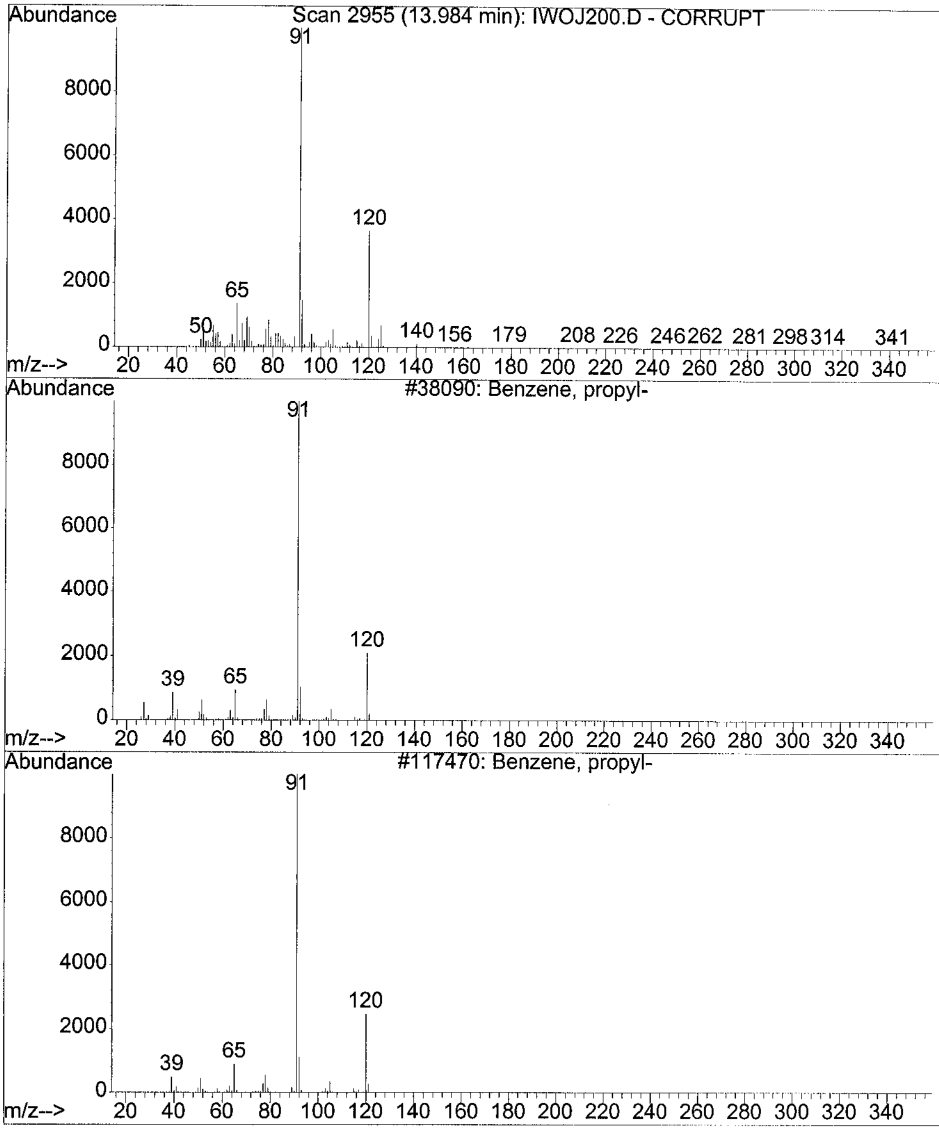


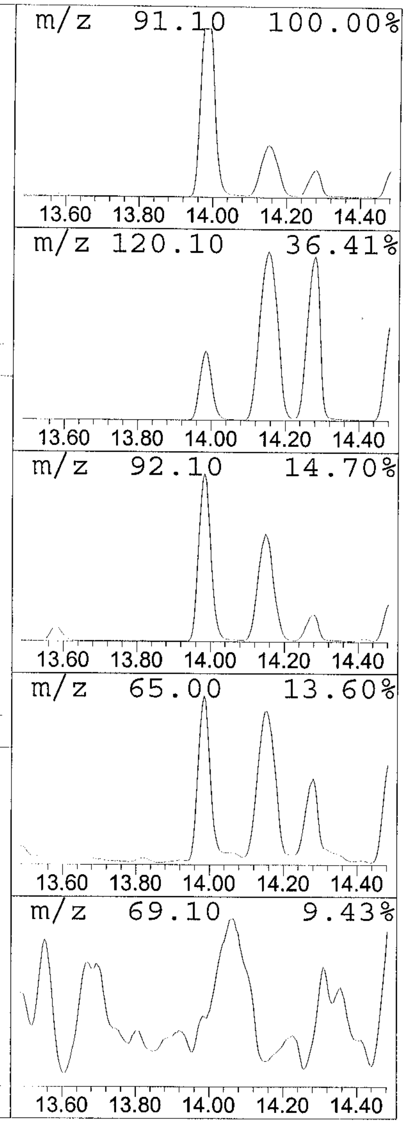
Peak Number: 21 at 13.93 min Area: 37071927 Area % 0.57

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Decane	109556	000124-18-5	50
2 Heptadecane, 2,6,10,14-tetramethyl-	16519	018344-37-1	47

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



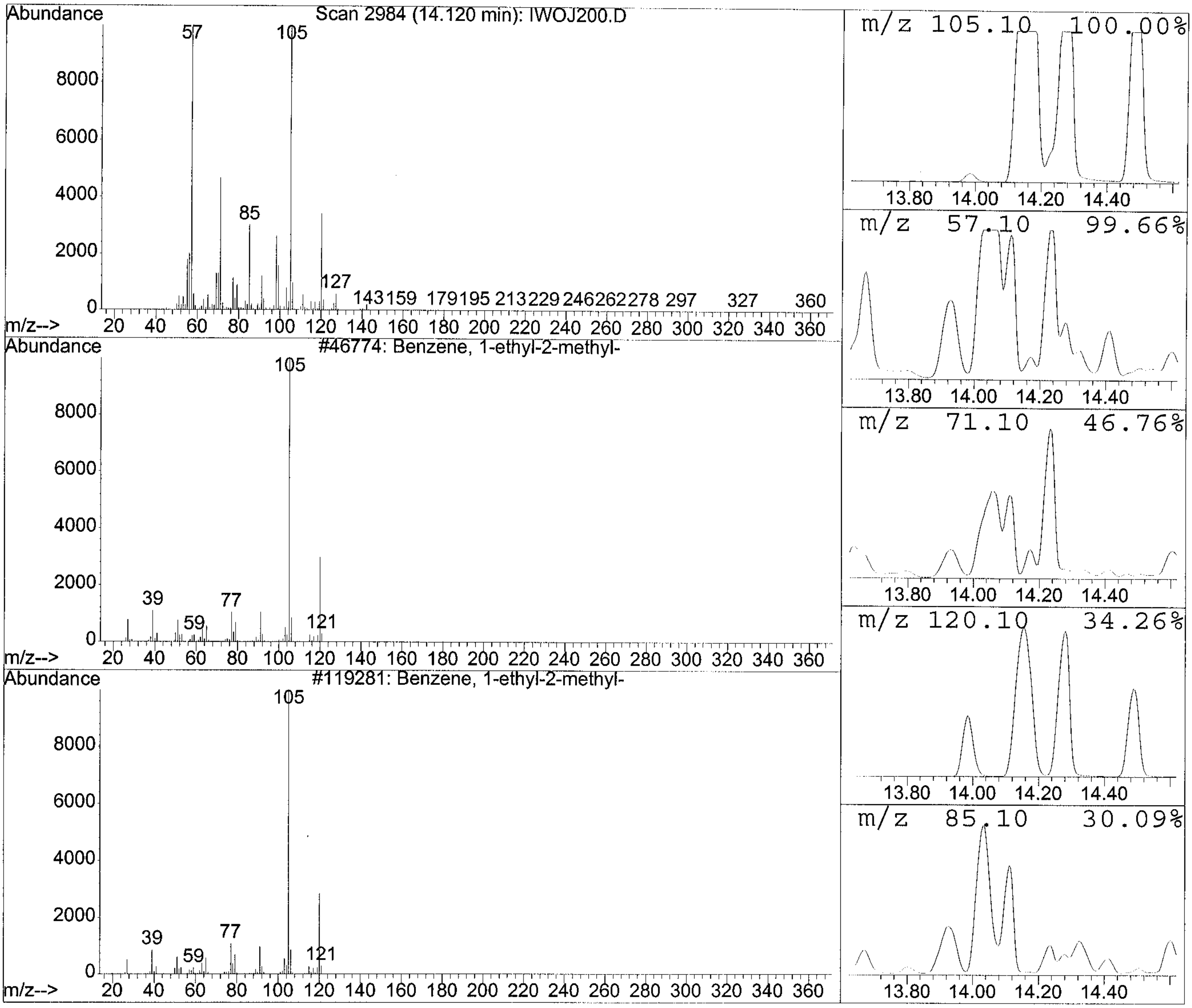


Peak Number: 22 at 13.98 min Area: 37356559 Area % 0.58

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, propyl-	38090	000103-65-1	70
2 Benzene, propyl-	117470	000103-65-1	70

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

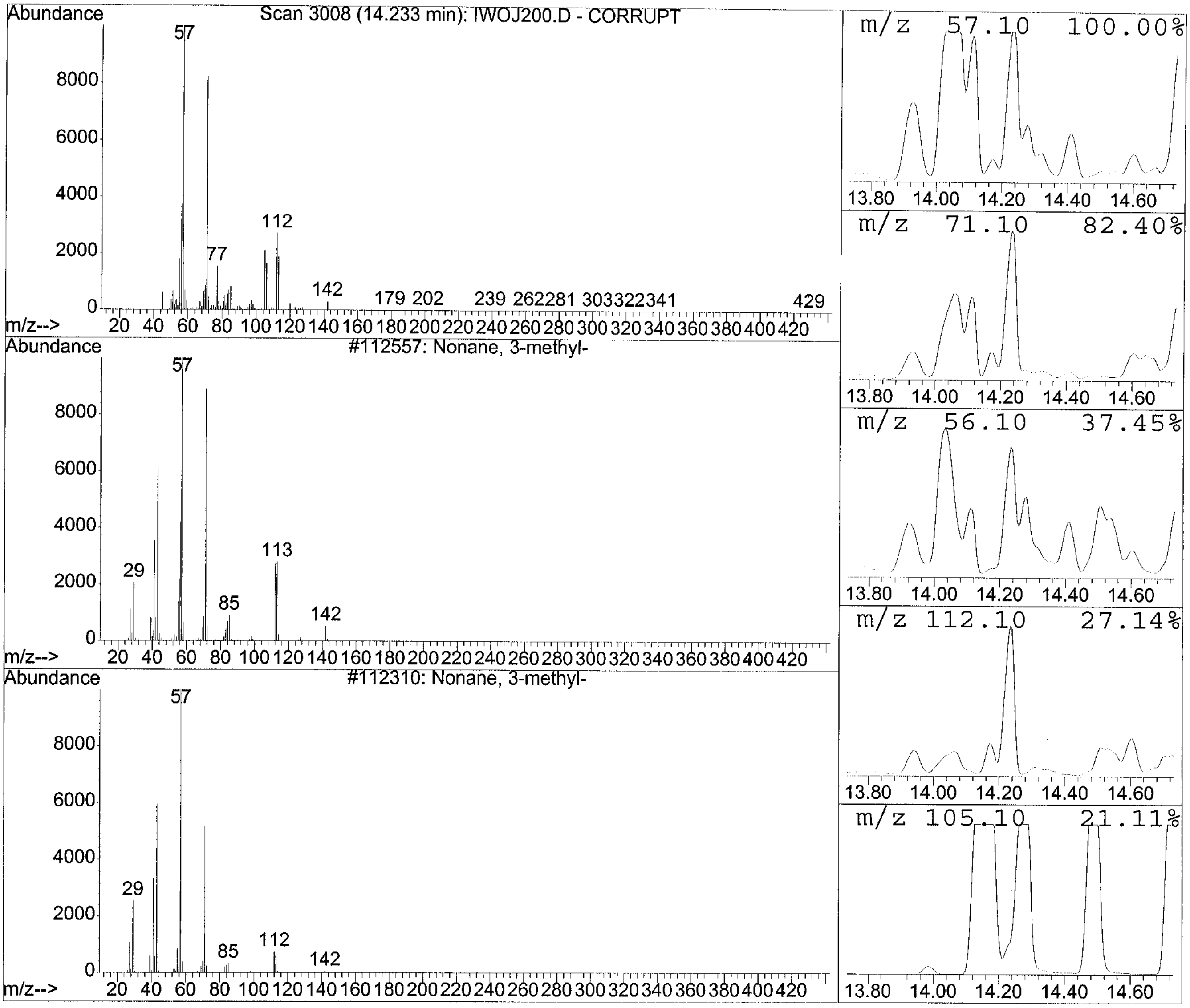


Peak Number: 23 at 14.12 min Area: 28860699 Area % 0.44

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-ethyl-2-methyl-	46774	000611-14-3	56
2 Benzene, 1-ethyl-2-methyl-	119281	000611-14-3	56

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

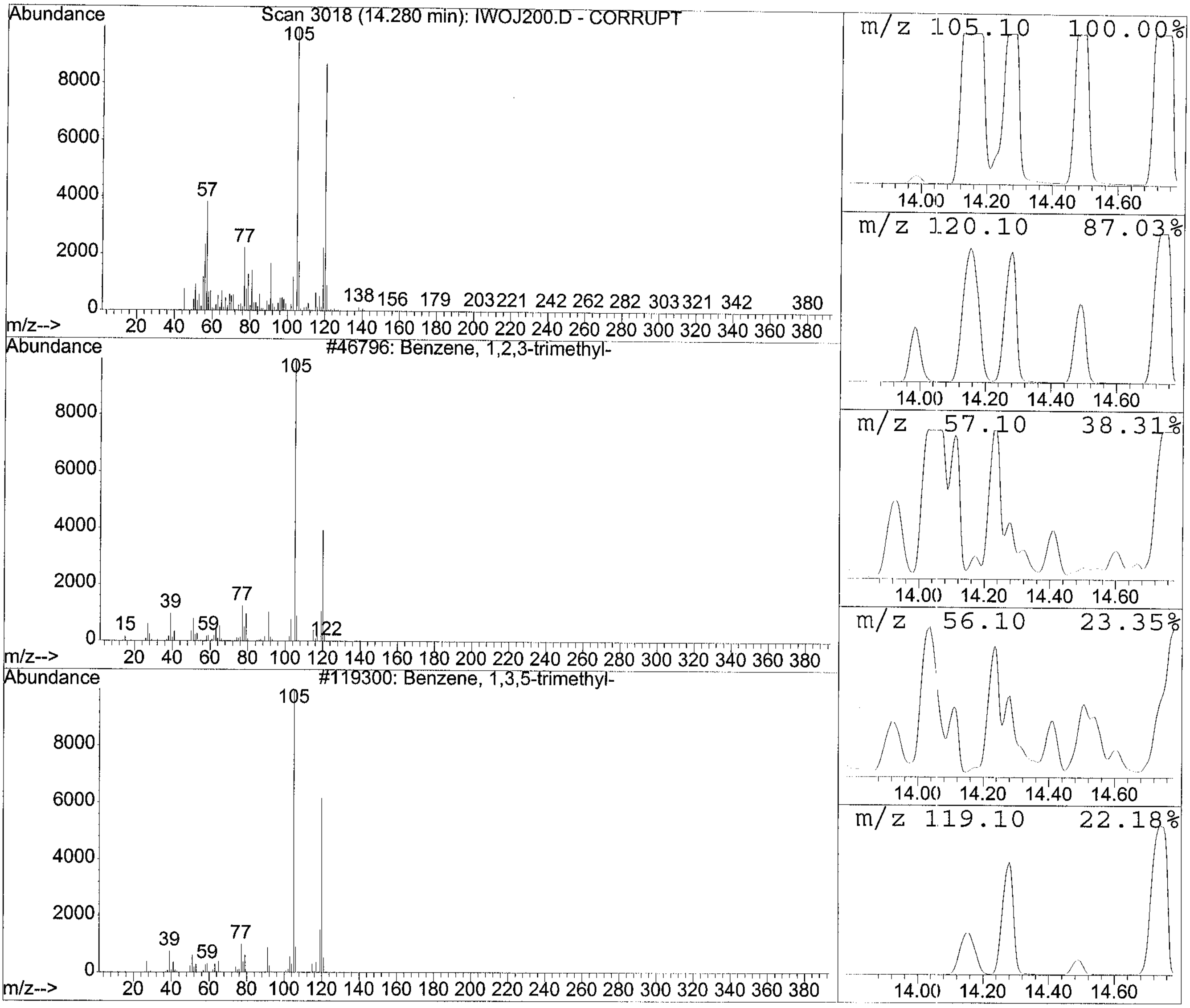


Peak Number: 24 at 14.23 min Area: 54192356 Area % 0.84

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Nonane, 3-methyl-	112557	005911-04-6	93
2 Nonane, 3-methyl-	112310	005911-04-6	81

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

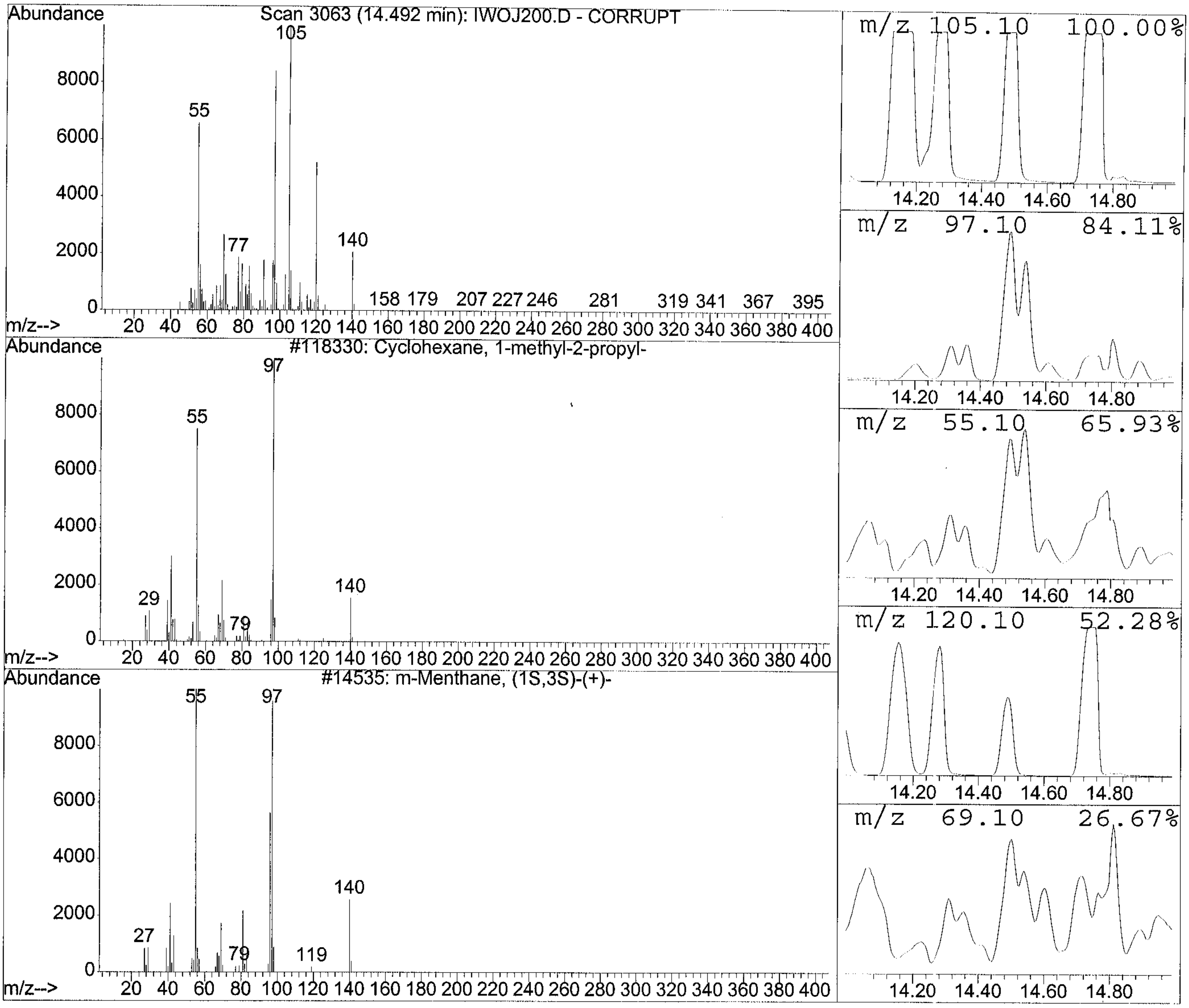


Peak Number: 25 at 14.28 min Area: 137764285 Area % 2.12

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,2,3-trimethyl-	46796	000526-73-8	87
2 Benzene, 1,3,5-trimethyl-	119300	000108-67-8	81

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

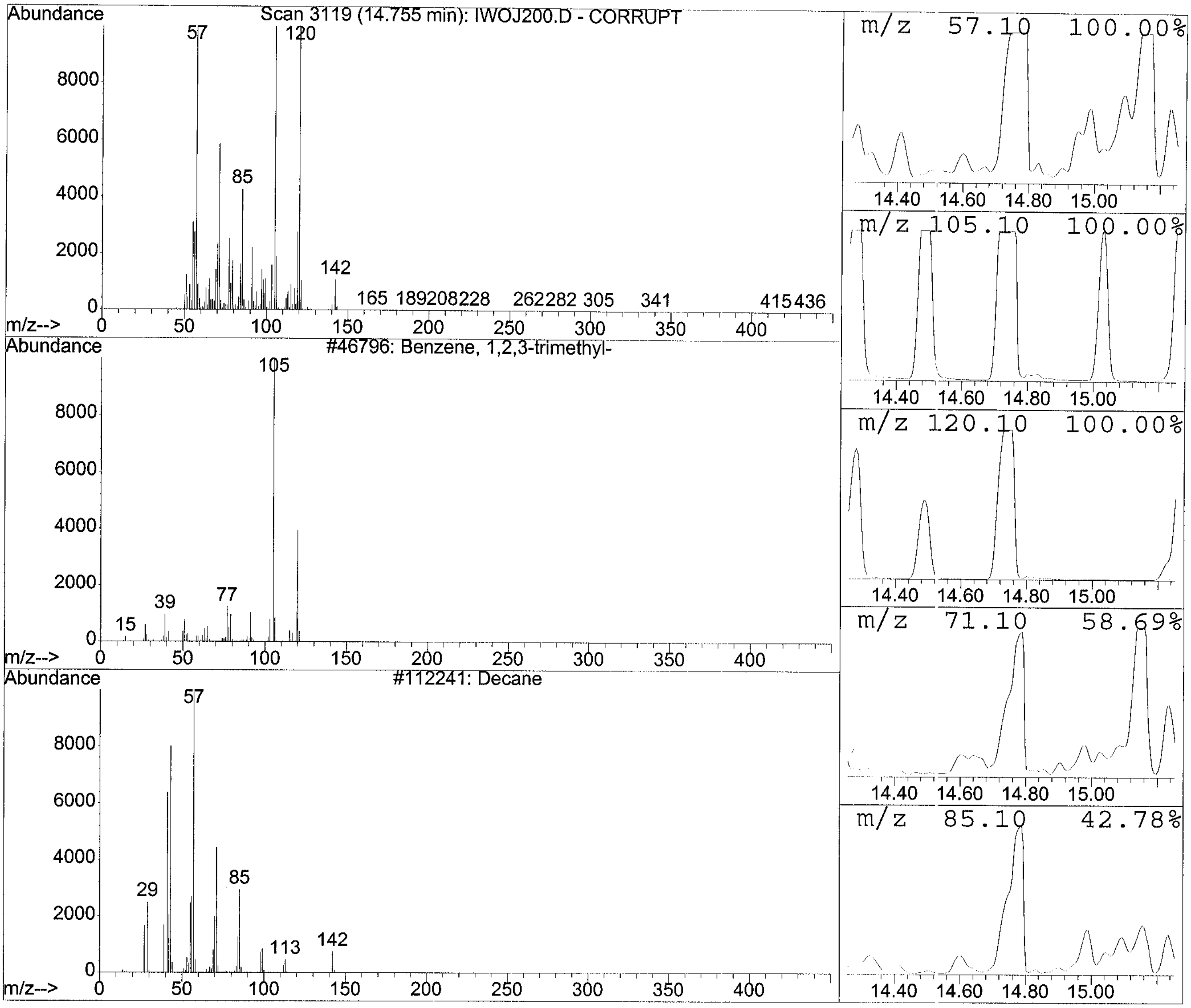


Peak Number: 26 at 14.49 min Area: 145360844 Area % 2.24

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, 1-methyl-2-propyl-	118330	004291-79-6	49
2 m-Menthane, (1S,3S)-(+)-	14535	013837-67-7	43

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

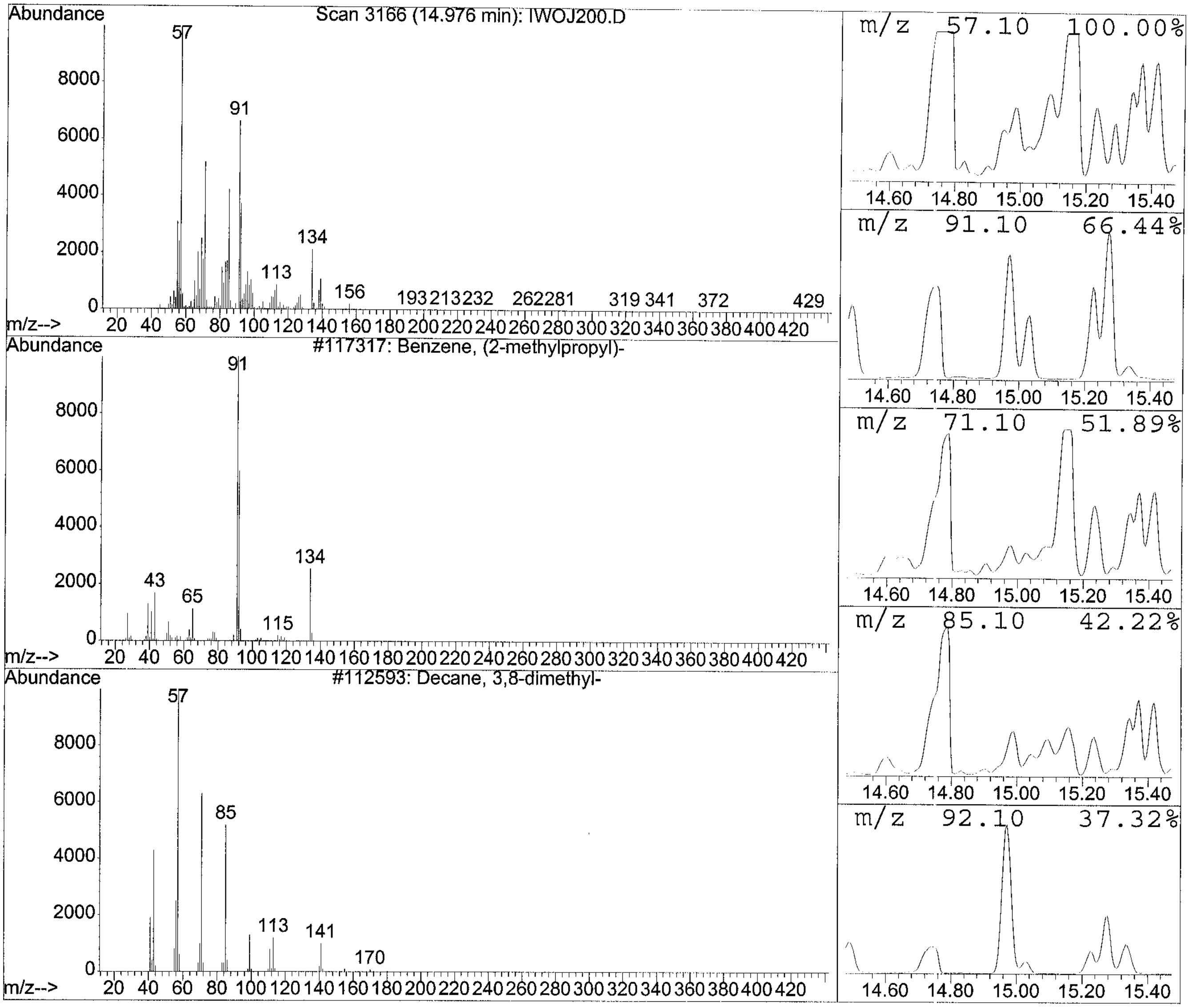


Peak Number: 27 at 14.76 min Area: 368508316 Area % 5.68

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,2,3-trimethyl-	46796	000526-73-8	87
2 Decane	112241	000124-18-5	80

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

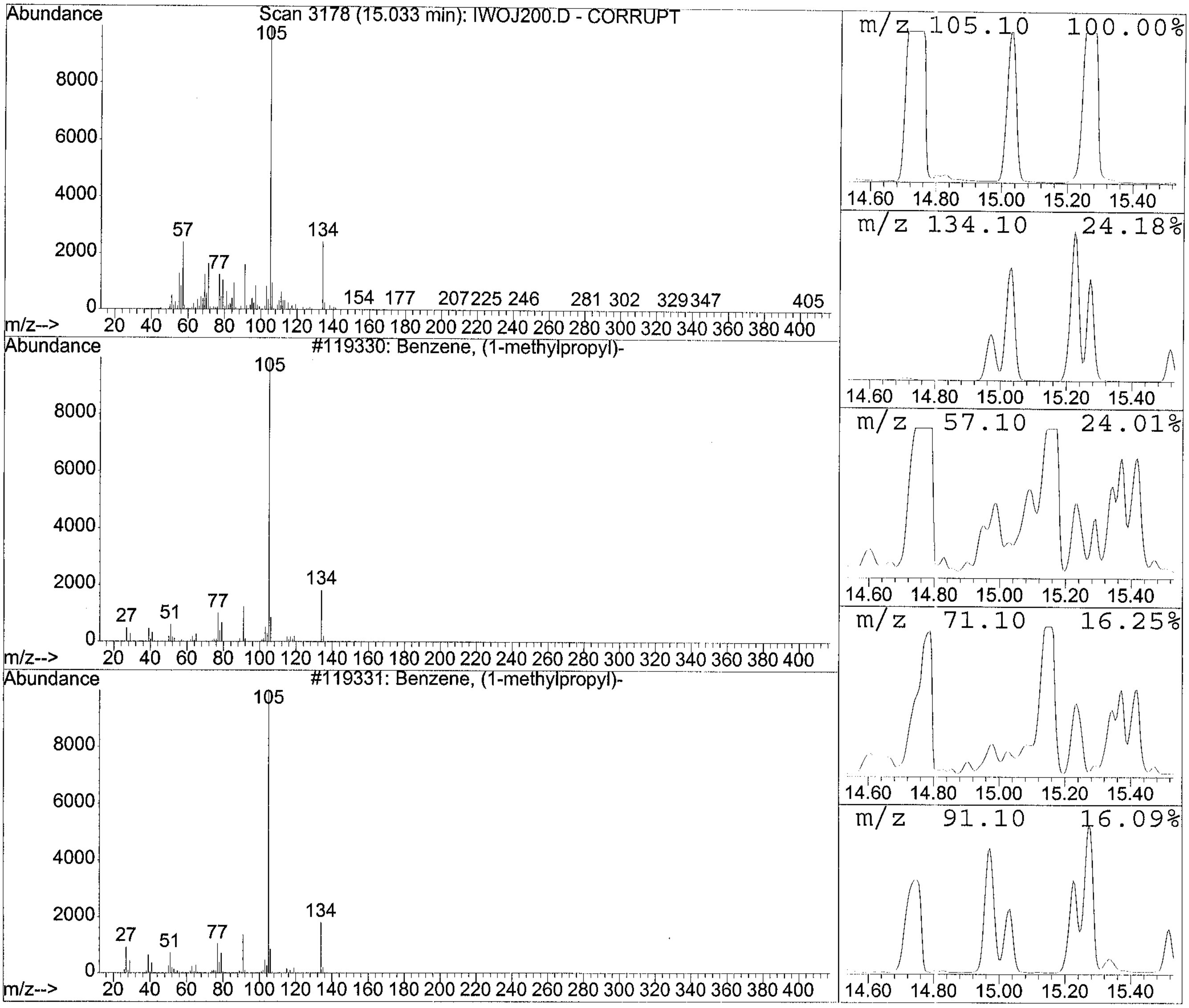


Peak Number: 28 at 14.98 min Area: 48822147 Area % 0.75

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, (2-methylpropyl)-	117317	000538-93-2	53
2 Decane, 3,8-dimethyl-	112593	017312-55-9	50

Library Search Report - RTE Integrator

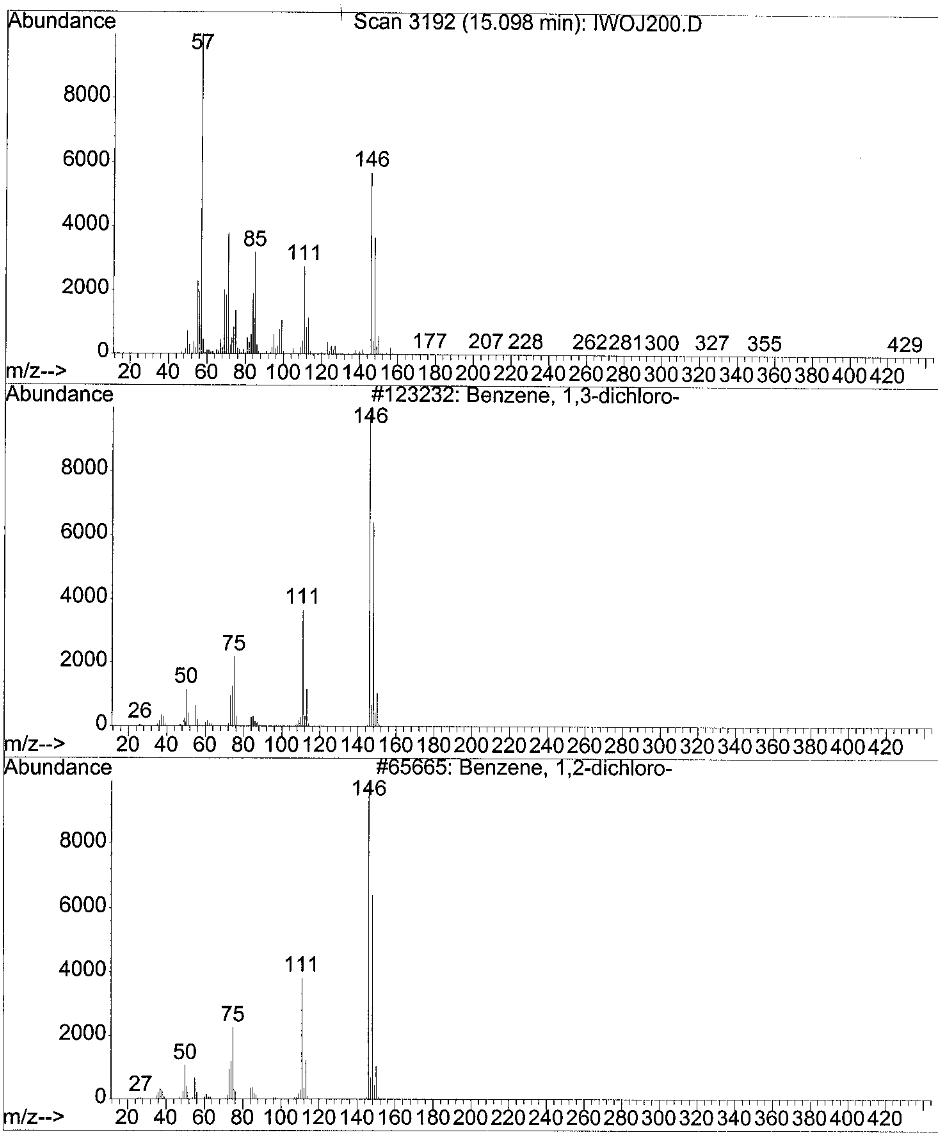
Unknown Spectrum based on Apex

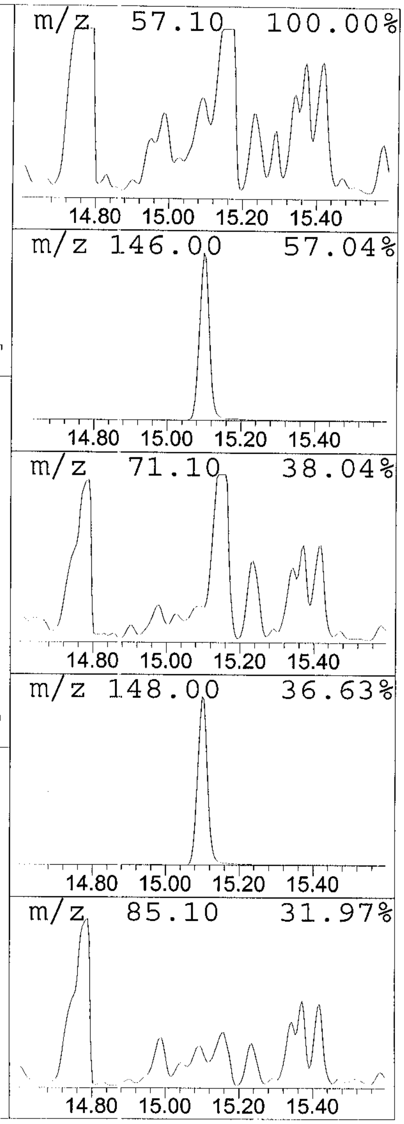


Peak Number: 29 at 15.03 min Area: 35584572 Area % 0.55

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, (1-methylpropyl)-	119330	000135-98-8	70
2 Benzene, (1-methylpropyl)-	119331	000135-98-8	70

Unknown Spectrum based on Apex



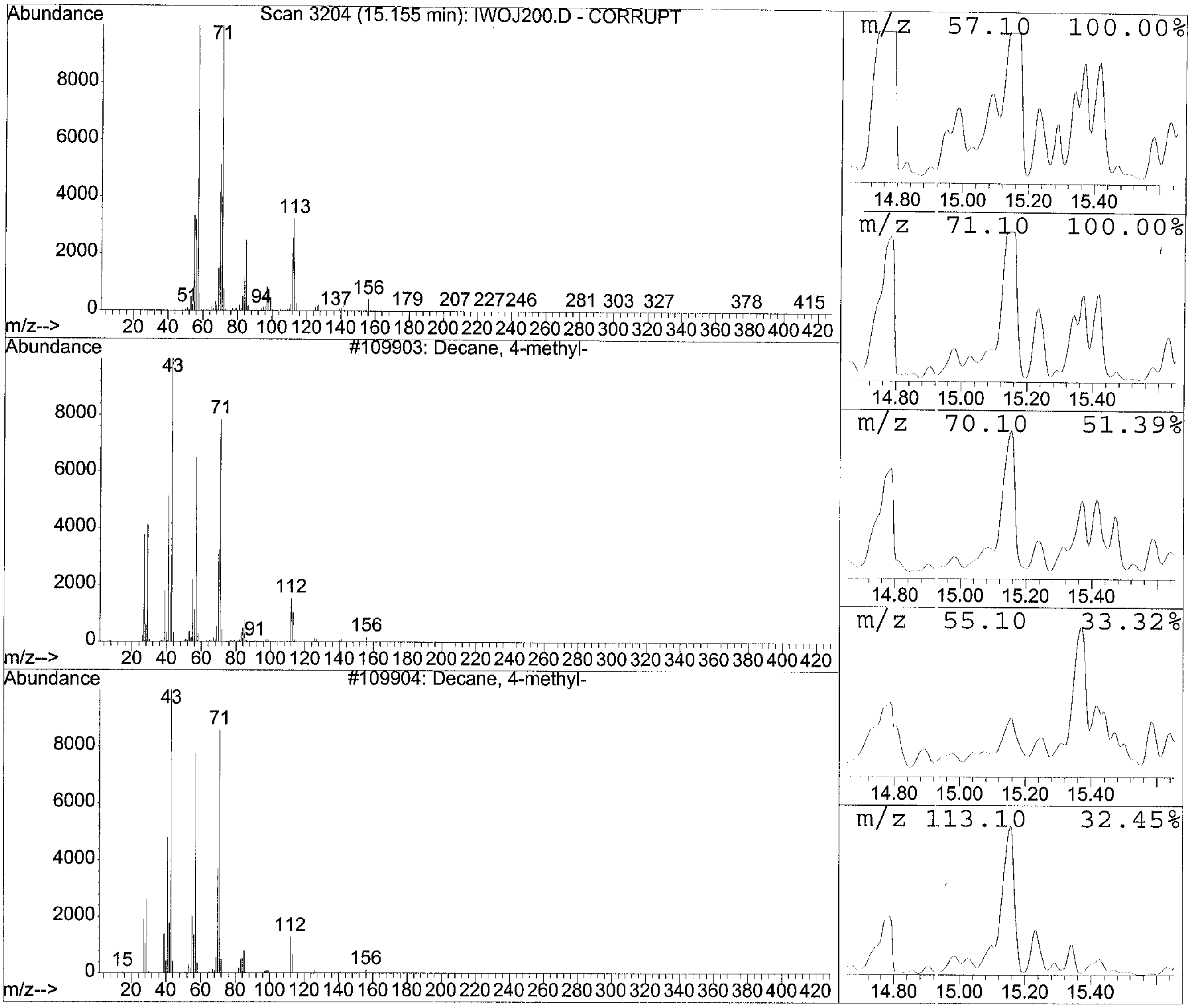


Peak Number: 30 at 15.10 min Area: 28764331 Area % 0.44

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,3-dichloro-	123232	000541-73-1	94
2 Benzene, 1,2-dichloro-	65665	000095-50-1	86

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

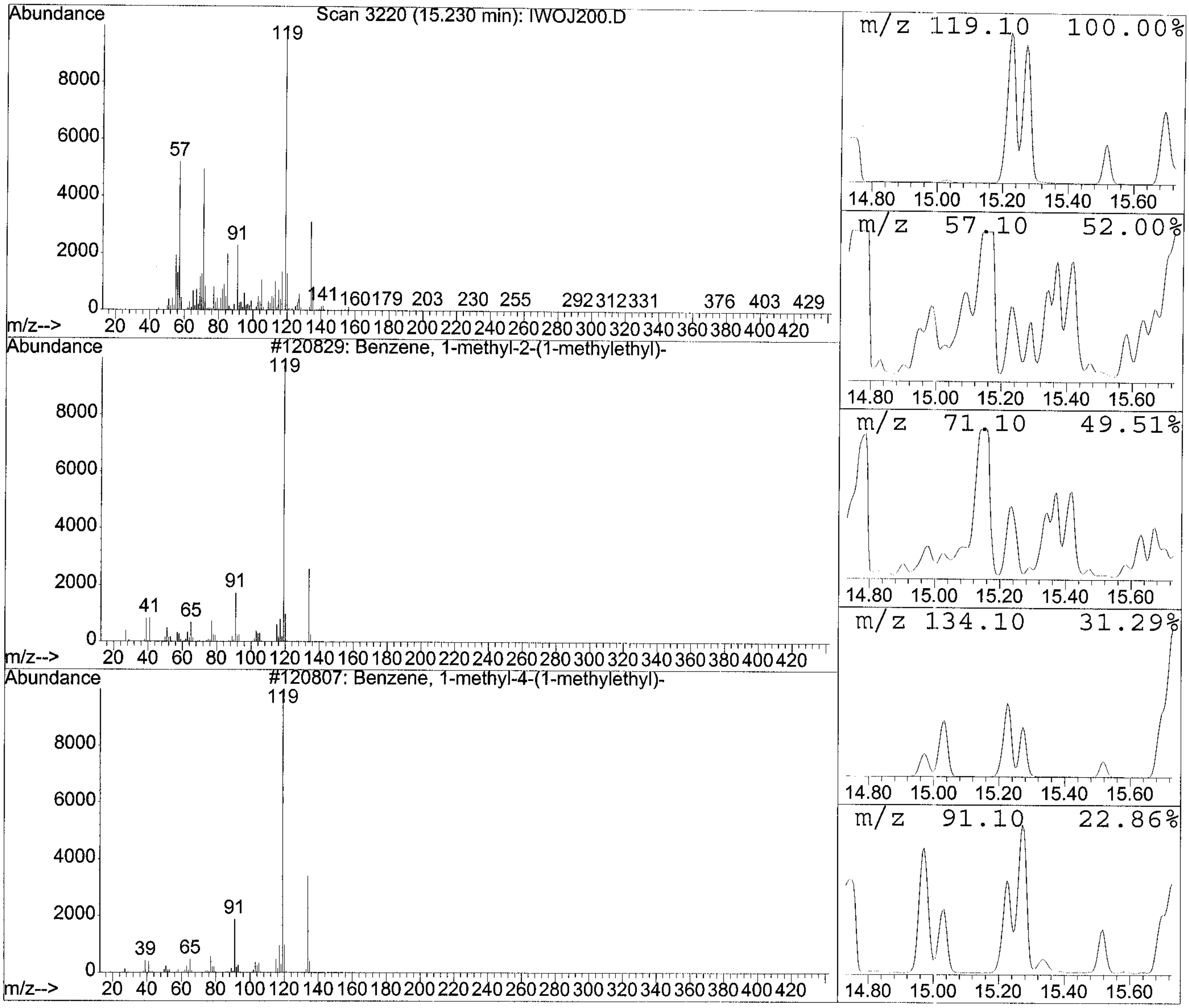


Peak Number: 31 at 15.15 min Area: 86000256 Area % 1.33

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Decane, 4-methyl-	109903	002847-72-5	83
2 Decane, 4-methyl-	109904	002847-72-5	59

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

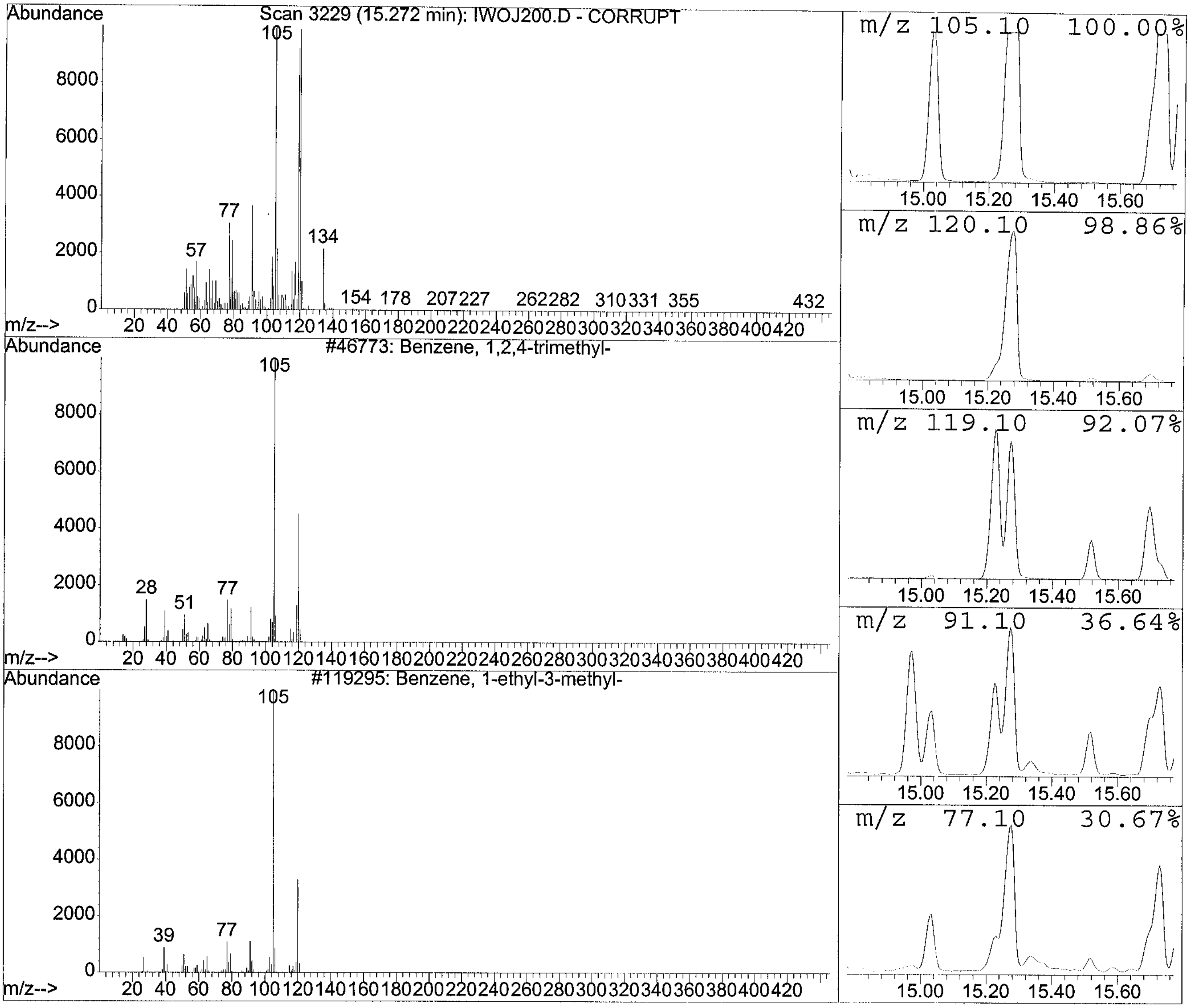


Peak Number: 32 at 15.23 min Area: 54480472 Area % 0.84

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-methyl-2-(1-methylethyl)	120829	000527-84-4	91
2 Benzene, 1-methyl-4-(1-methylethyl)	120807	000099-87-6	90

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

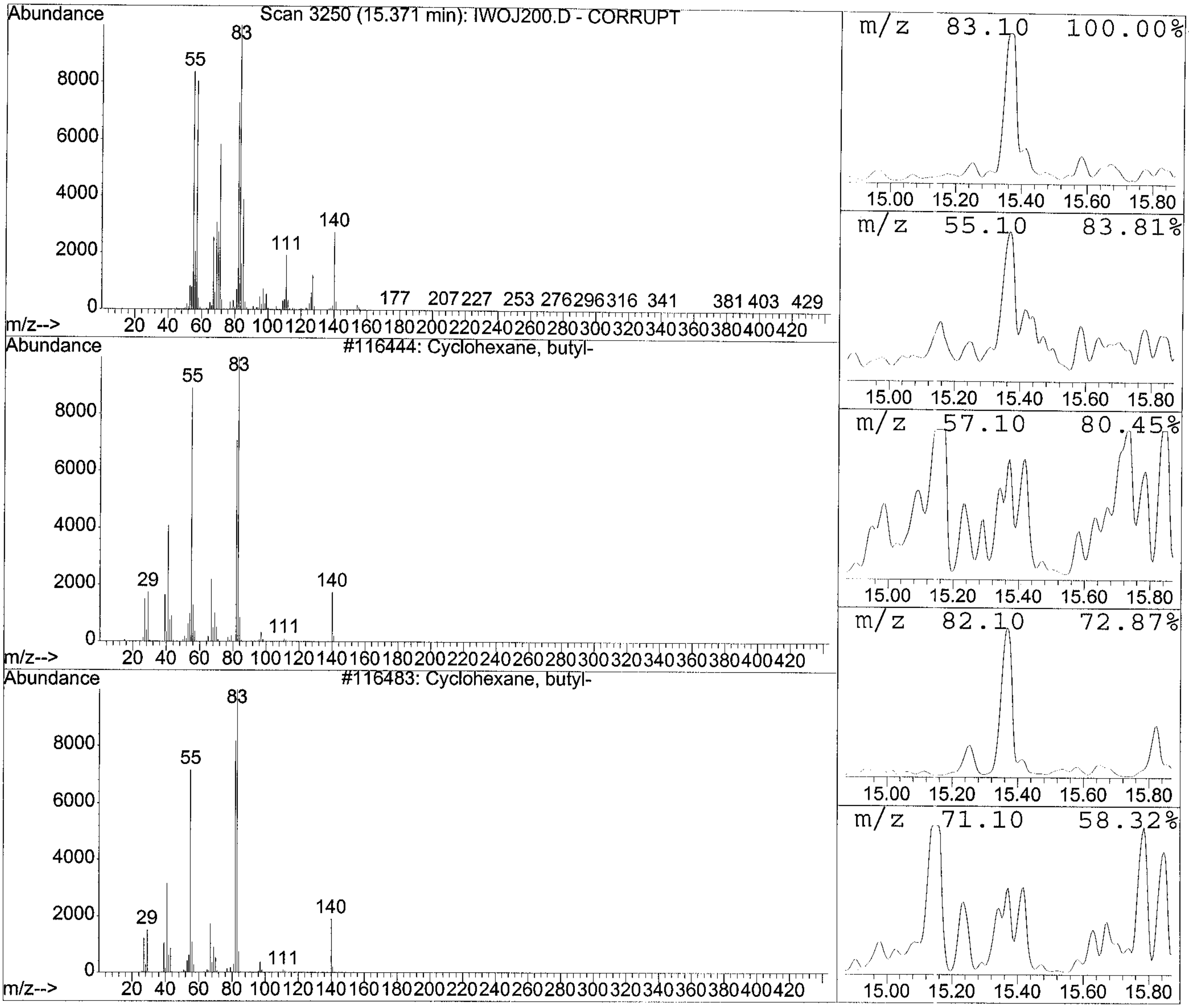


Peak Number: 33 at 15.27 min Area: 115025187 Area % 1.77

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,2,4-trimethyl-	46773	000095-63-6	60
2 Benzene, 1-ethyl-3-methyl-	119295	000620-14-4	60

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

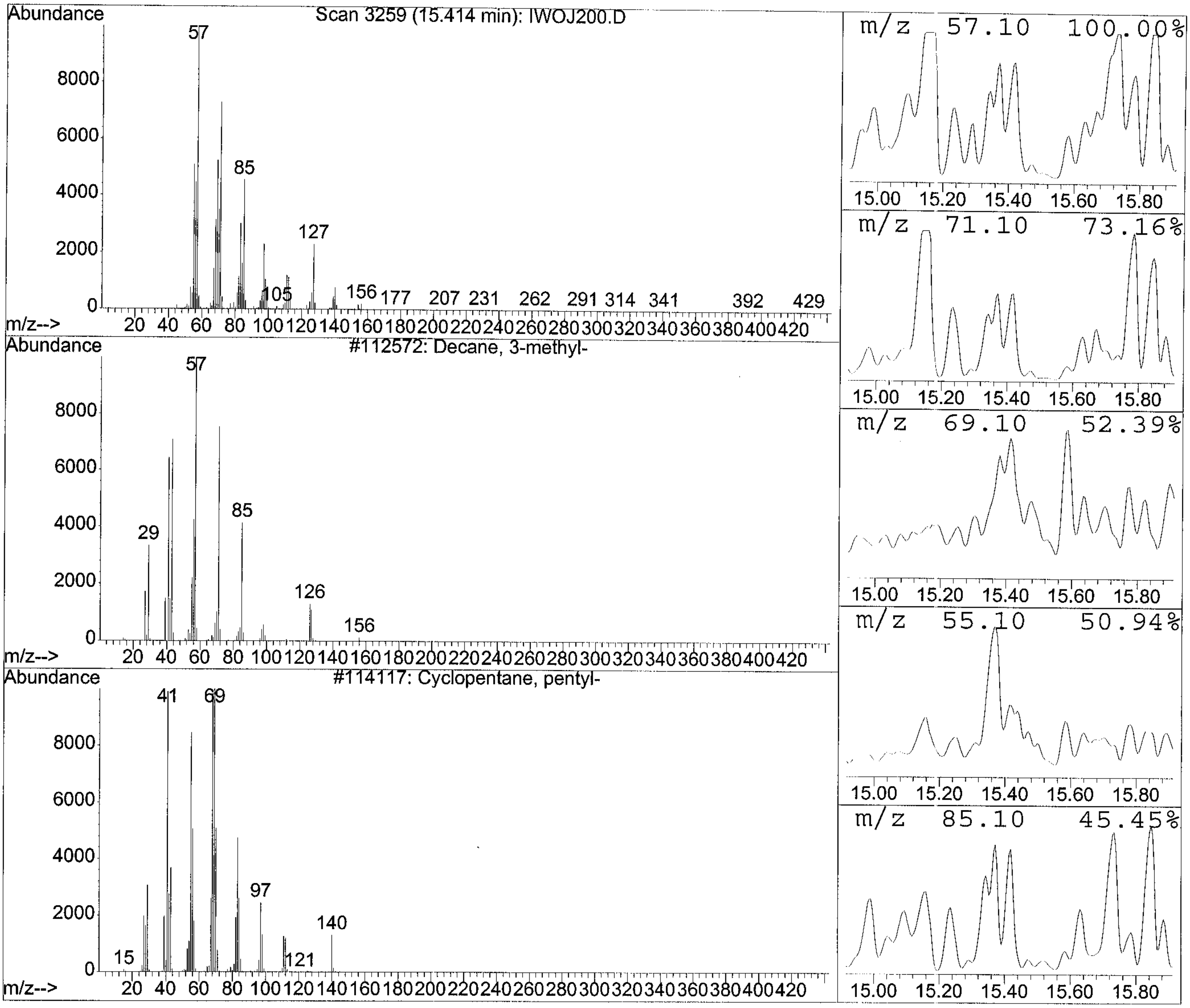


Peak Number: 34 at 15.37 min Area: 133388323 Area % 2.06

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, butyl-	116444	001678-93-9	53
2 Cyclohexane, butyl-	116483	001678-93-9	38

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

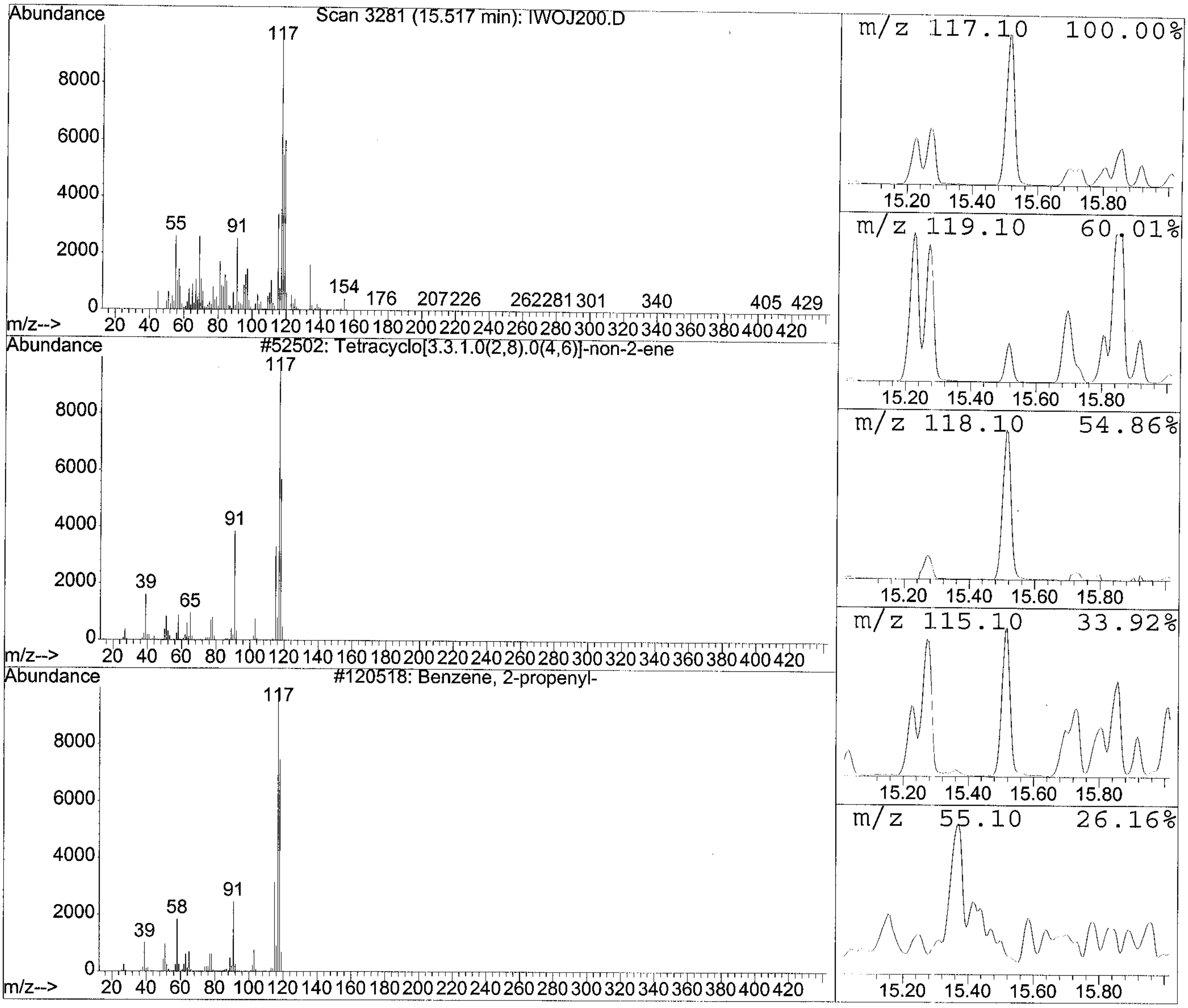


Peak Number: 35 at 15.41 min Area: 59220090 Area % 0.91

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Decane, 3-methyl-	112572	013151-34-3	58
2 Cyclopentane, pentyl-	114117	003741-00-2	52

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

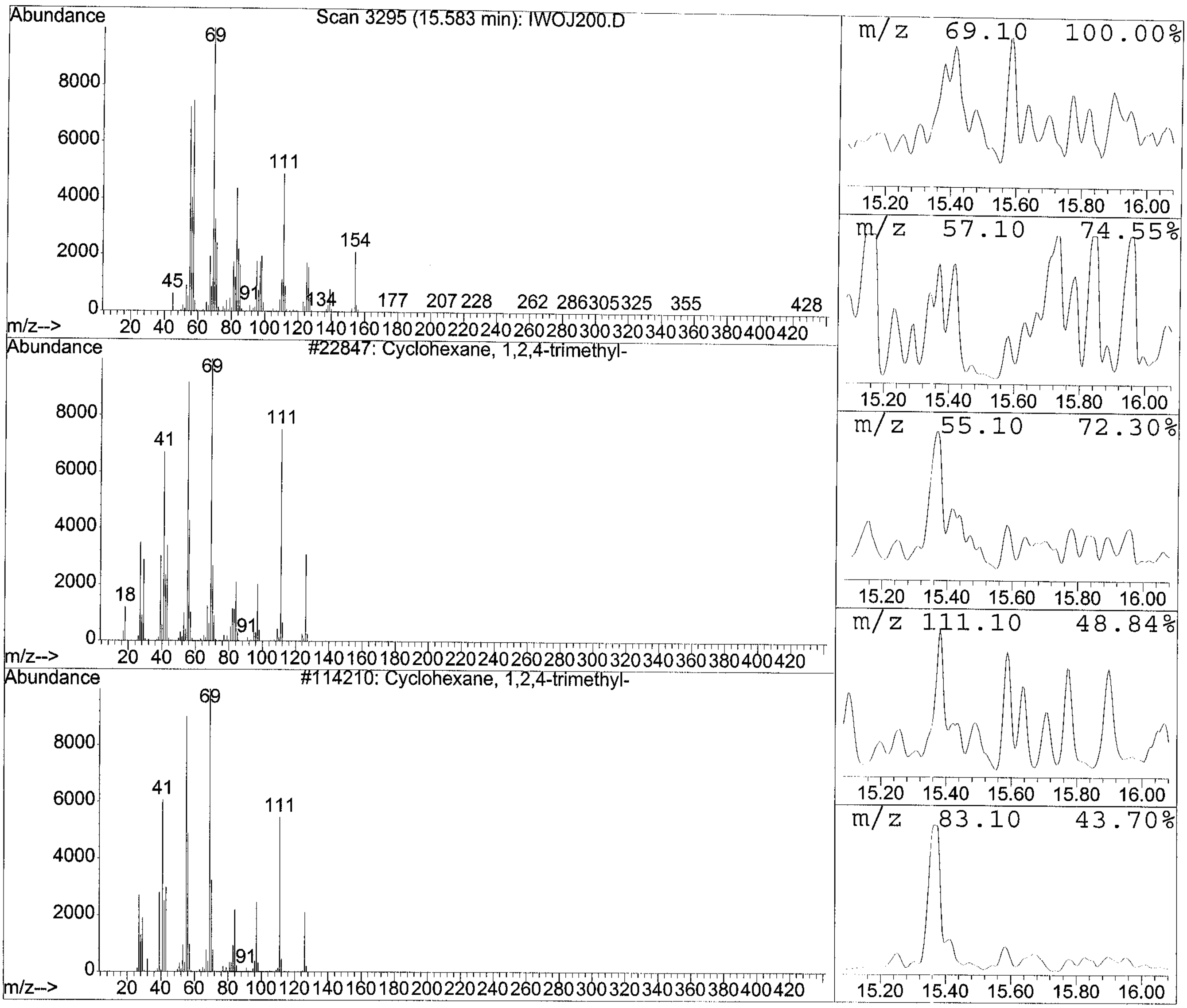


Peak Number: 36 at 15.52 min Area: 33873484 Area % 0.52

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Tetracyclo[3.3.1.0(2,8).0(4,6)]-non	52502	1000191-13-7	50
2 Benzene, 2-propenyl-	120518	000300-57-2	50

Library Search Report - RTE Integrator

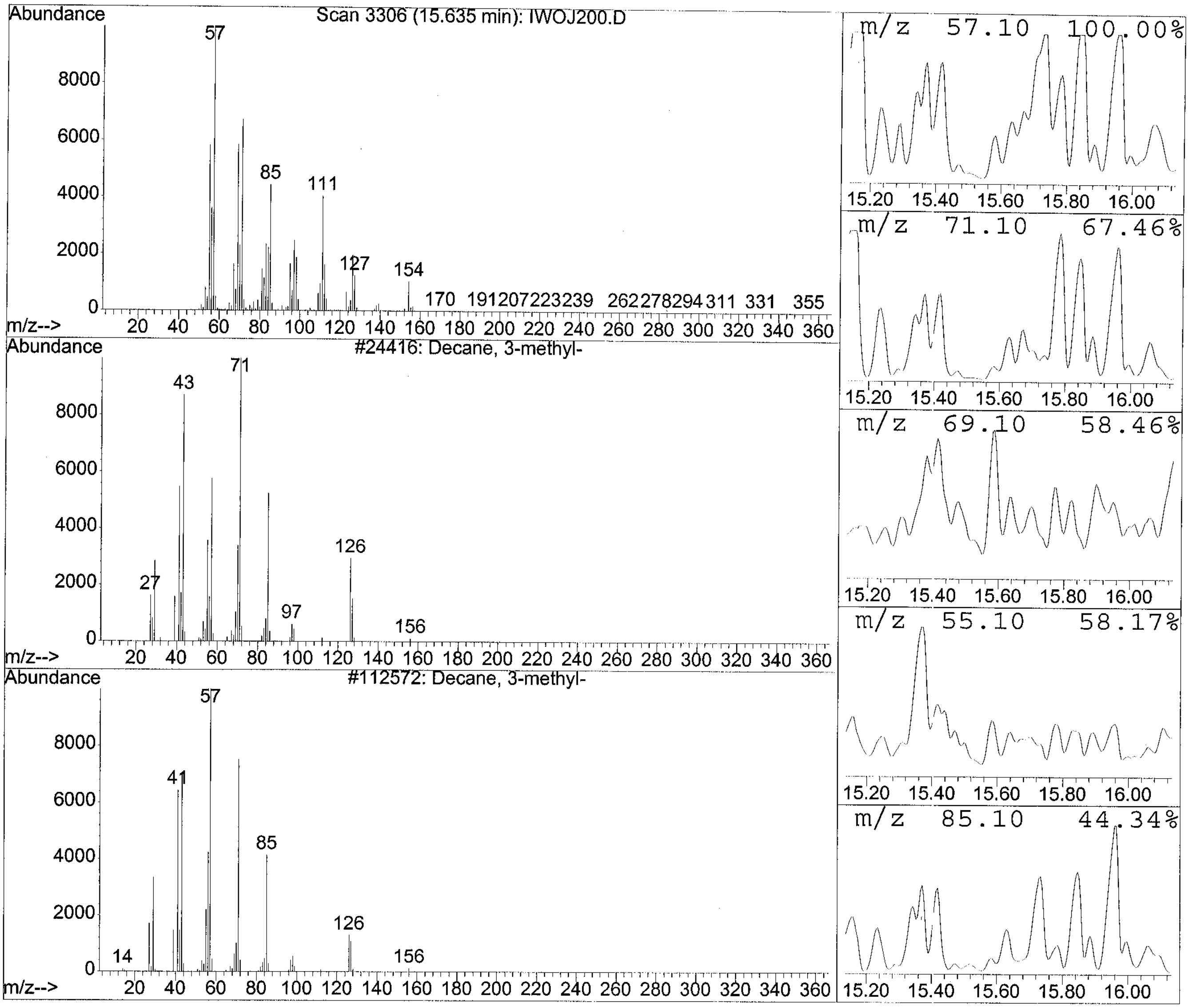
Unknown Spectrum based on Apex



Peak Number: 37 at 15.58 min Area: 35404803 Area % 0.55

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, 1,2,4-trimethyl-	22847	002234-75-5	70
2 Cyclohexane, 1,2,4-trimethyl-	114210	002234-75-5	64

Unknown Spectrum based on Apex

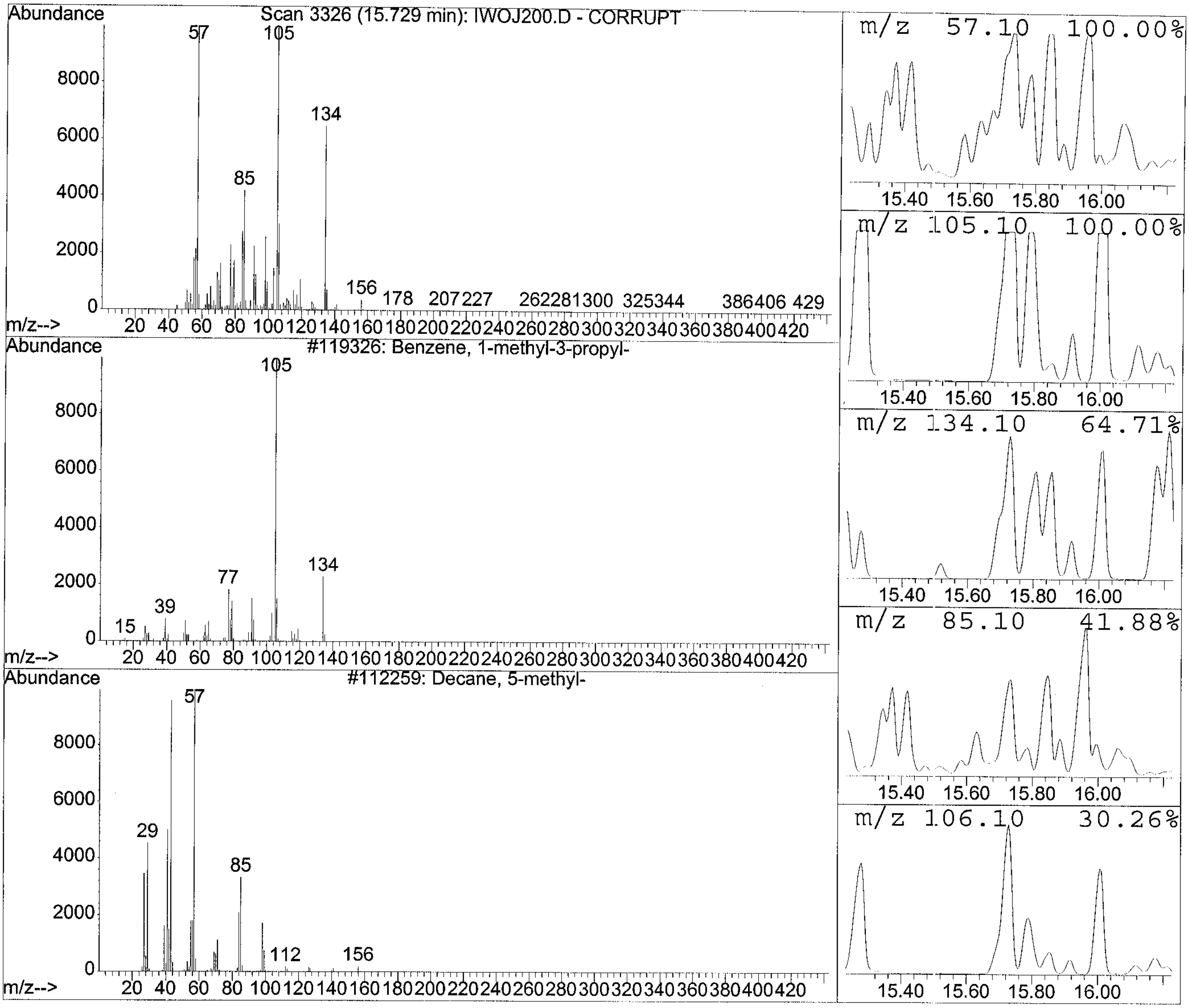


Peak Number: 38 at 15.63 min Area: 22303520 Area % 0.34

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Decane, 3-methyl-	24416	013151-34-3	49
2 Decane, 3-methyl-	112572	013151-34-3	43

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



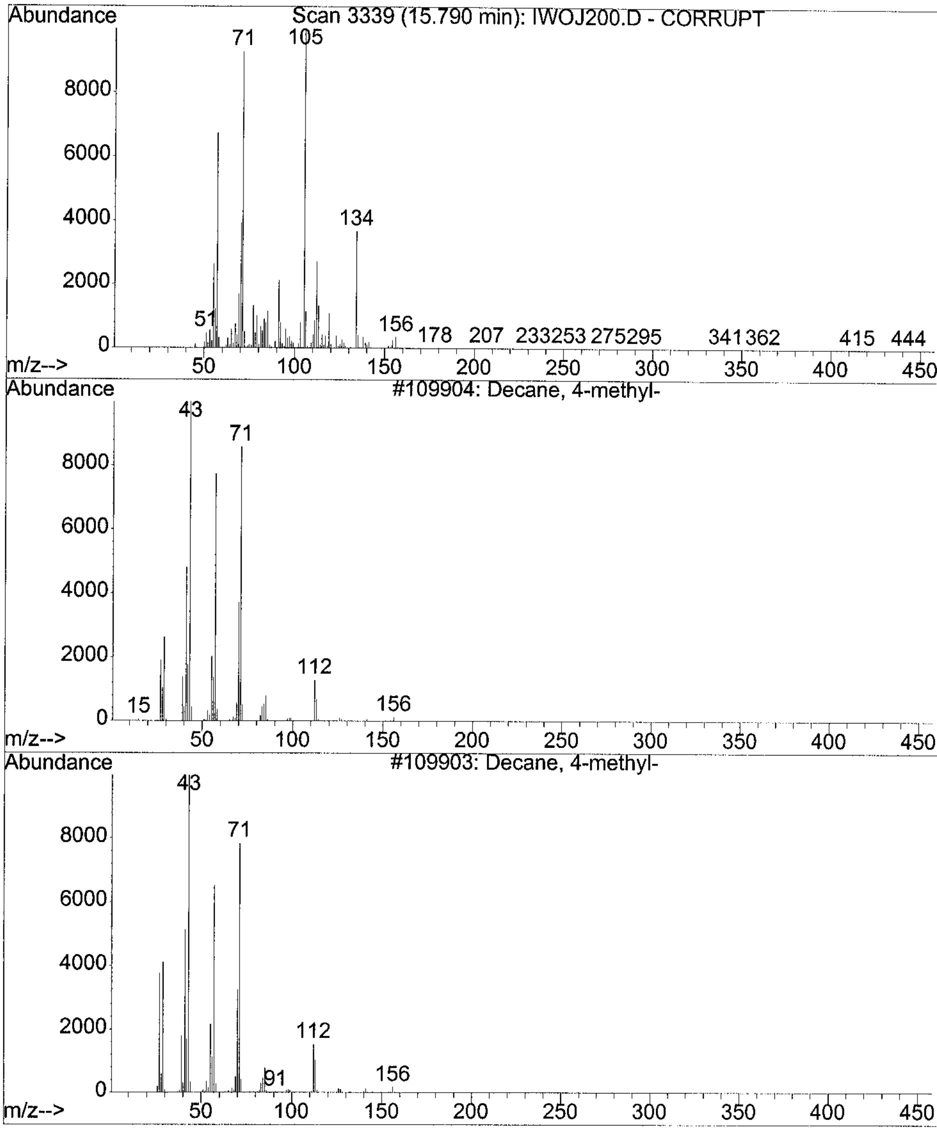
Peak Number: 39 at 15.73 min Area: 137867267 Area % 2.13

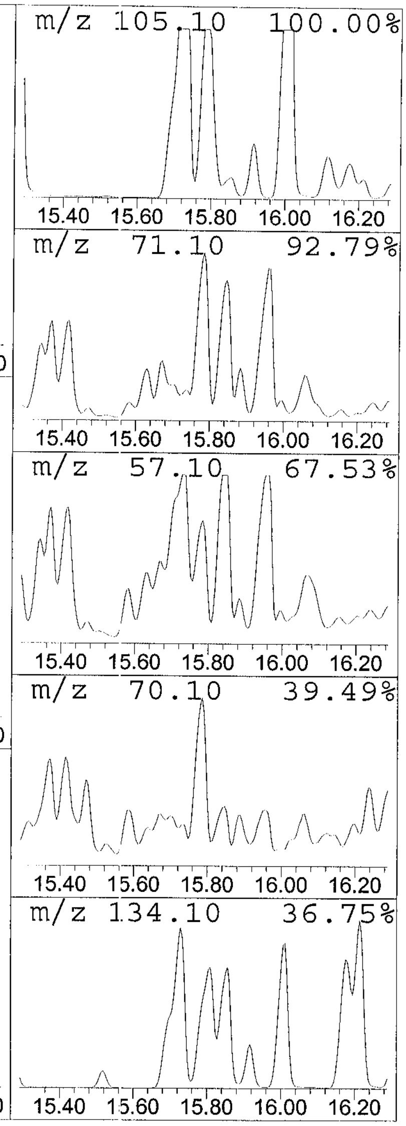
The 3 best hits from each library.

	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-methyl-3-propyl-	119326	001074-43-7	46
2 Decane, 5-methyl-	112259	013151-35-4	46

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



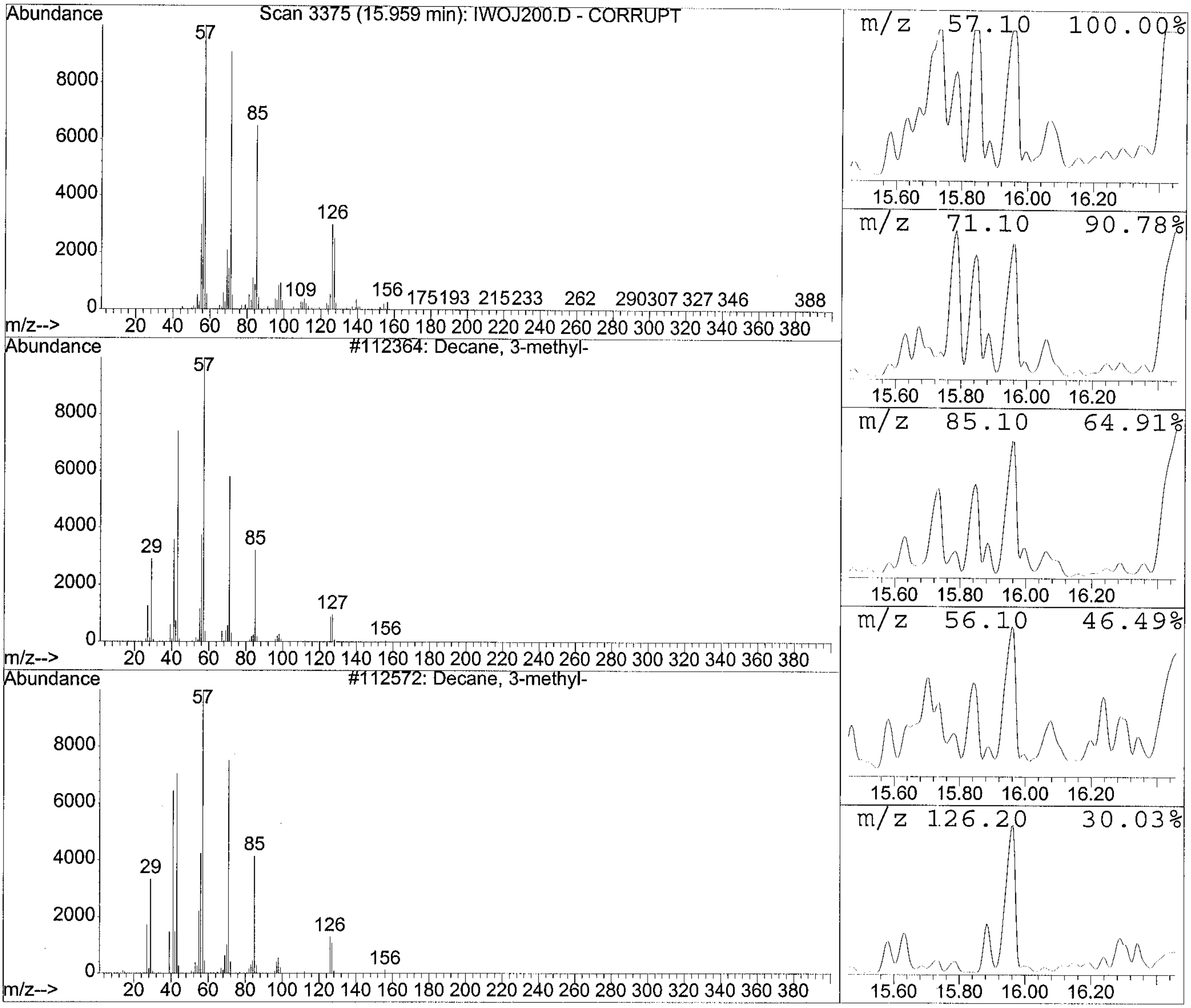


Peak Number: 40 at 15.79 min Area: 80268740 Area % 1.24

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Decane, 4-methyl-	109904	002847-72-5	70
2 Decane, 4-methyl-	109903	002847-72-5	64

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

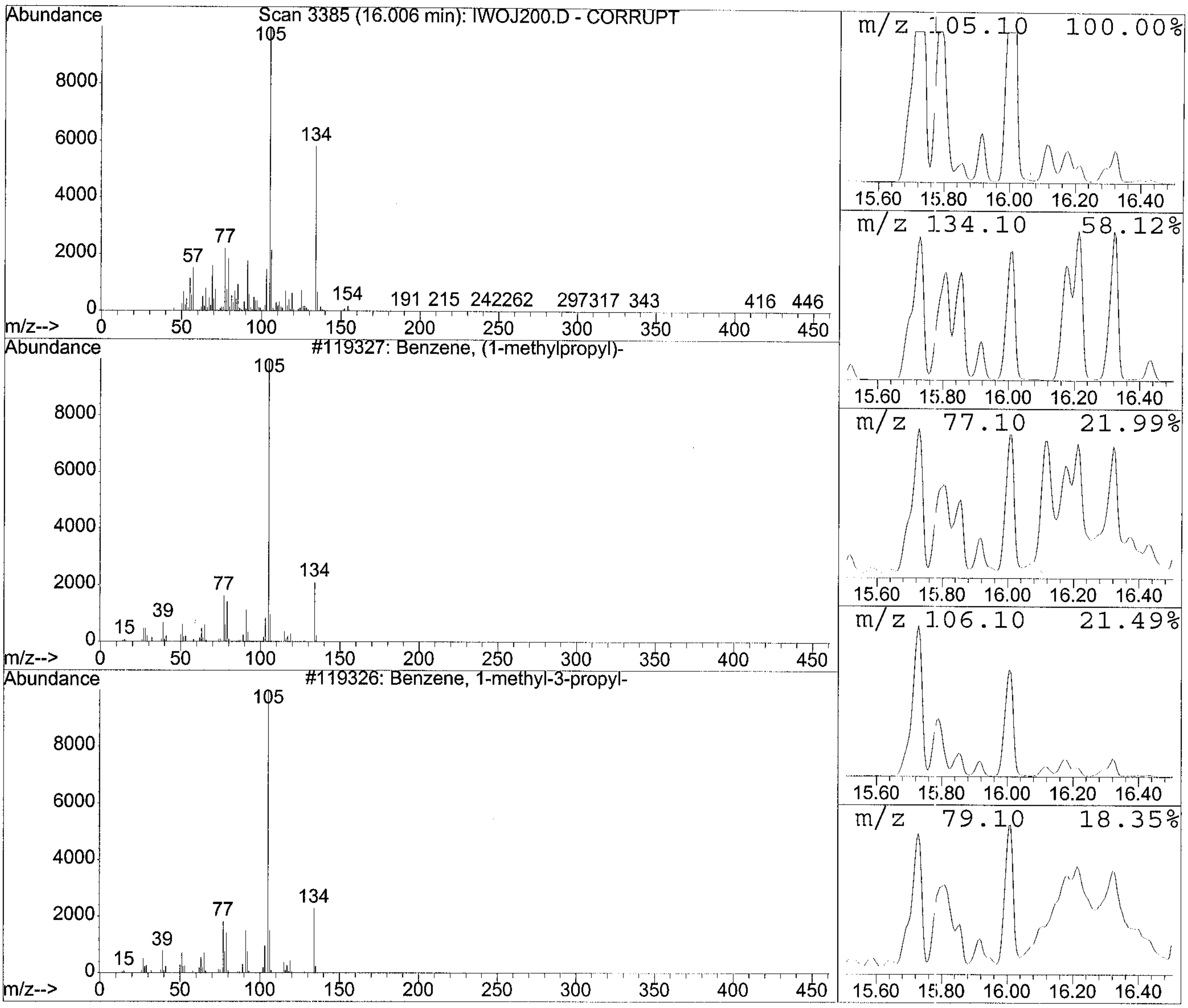


Peak Number: 41 at 15.96 min Area: 62425742 Area % 0.96

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Decane, 3-methyl-	112364	013151-34-3	95
2 Decane, 3-methyl-	112572	013151-34-3	94

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

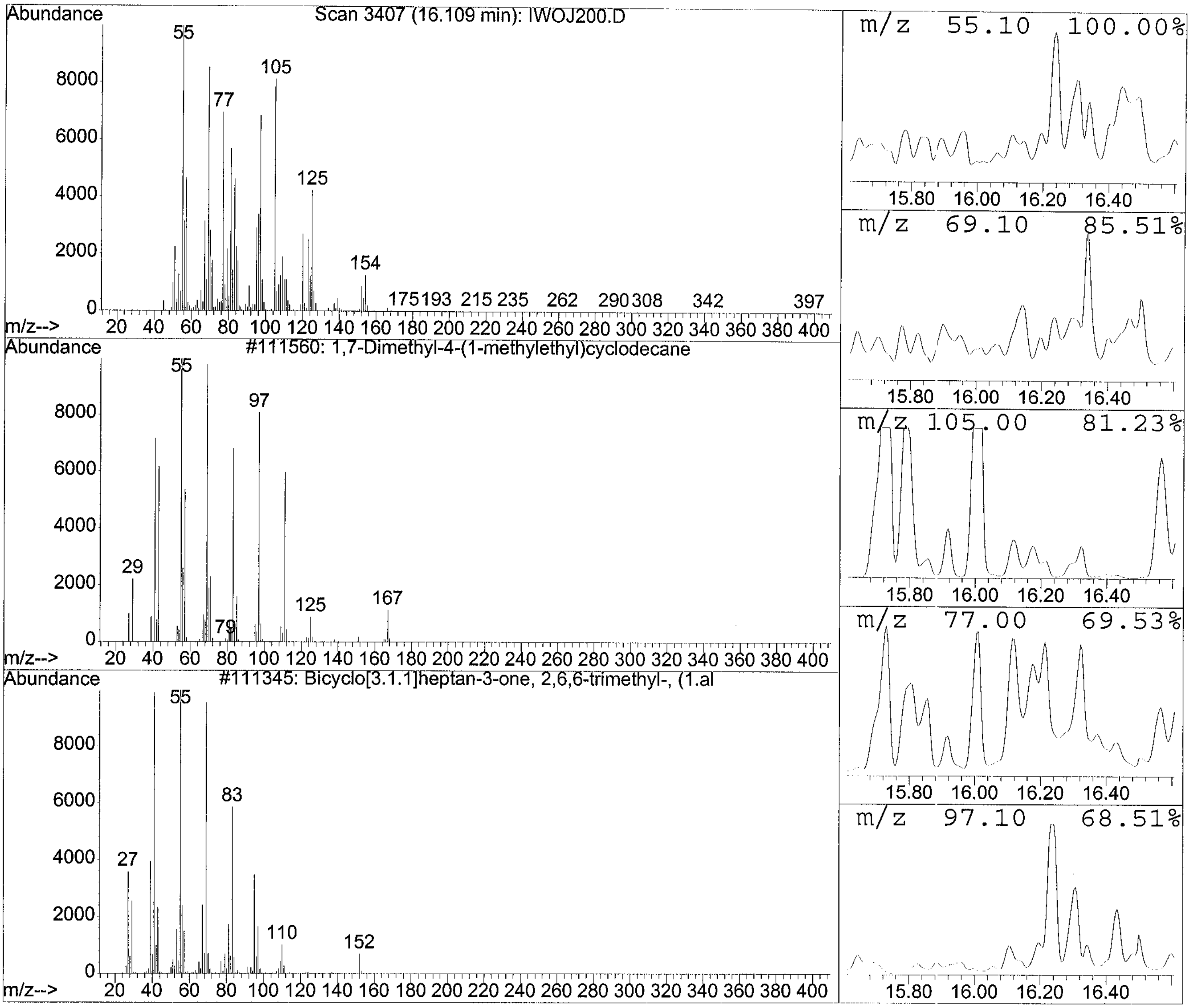


Peak Number: 42 at 16.01 min Area: 54453020 Area % 0.84

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, (1-methylpropyl)-	119327	000135-98-8	93
2 Benzene, 1-methyl-3-propyl-	119326	001074-43-7	81

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

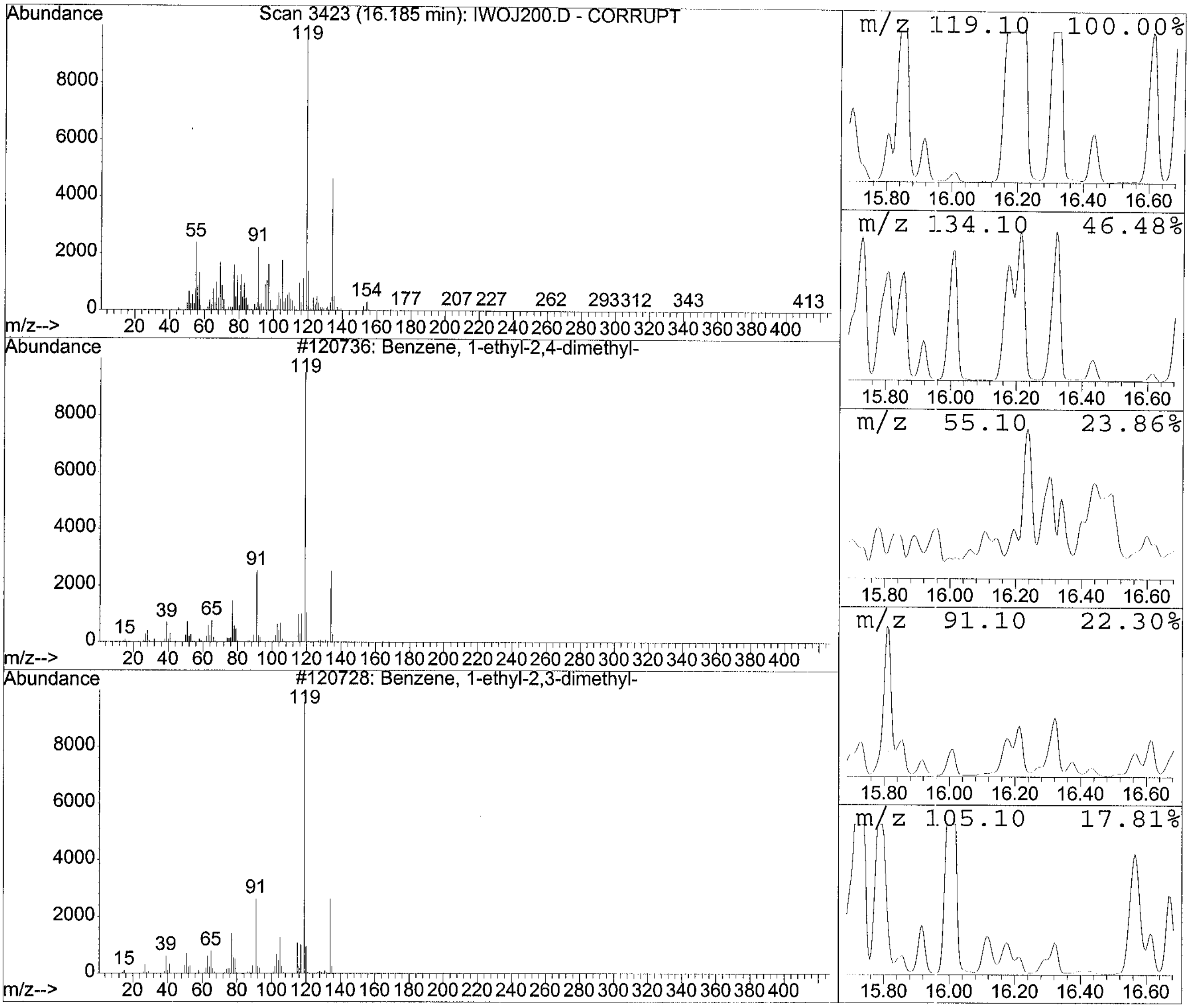


Peak Number: 43 at 16.11 min Area: 15664737 Area % 0.24

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1,7-Dimethyl-4-(1-methylethyl)cyclo	111560	000645-10-3	38
2 Bicyclo[3.1.1]heptan-3-one, 2,6,6-t	111345	015358-88-0	38

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

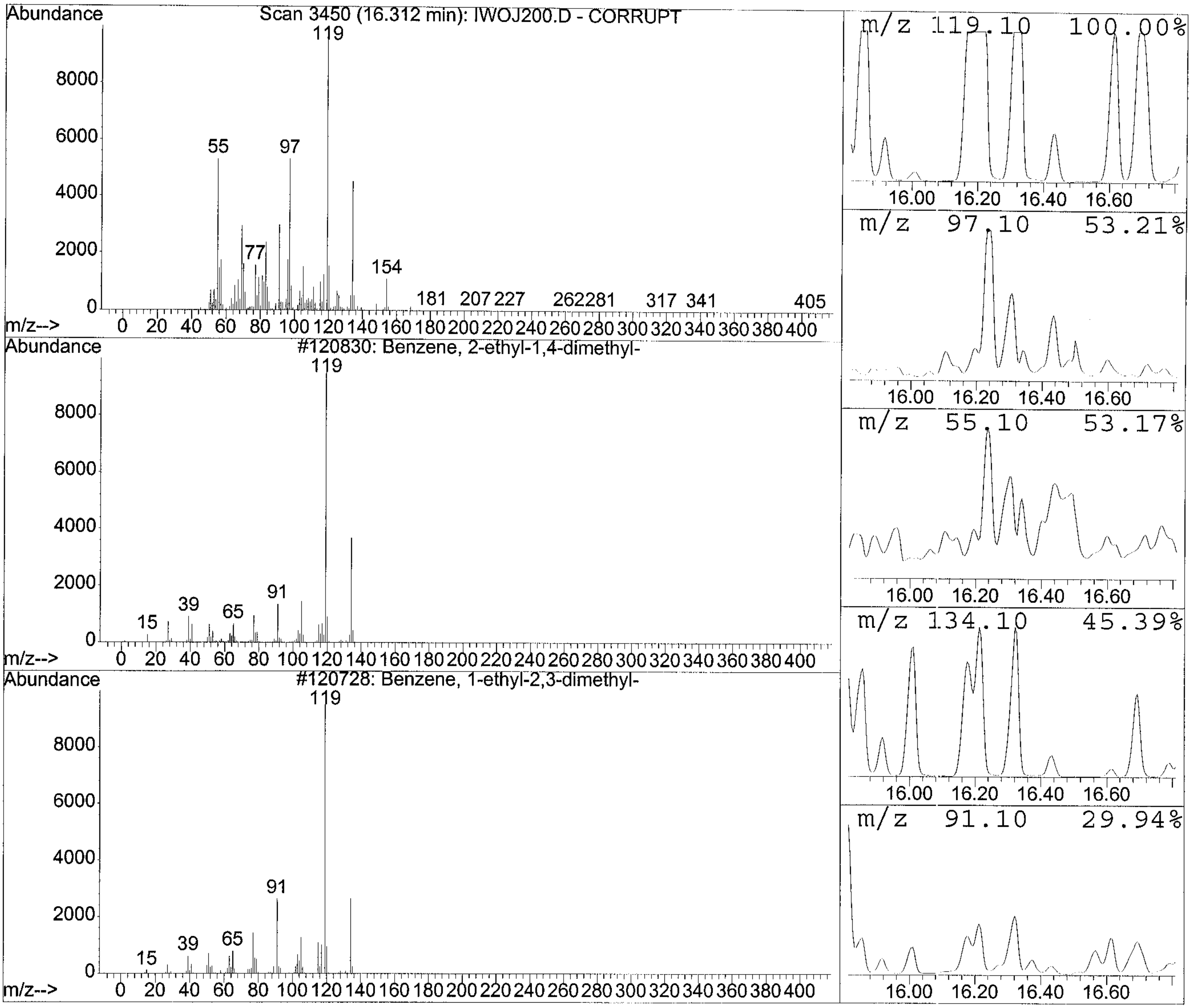


Peak Number: 44 at 16.18 min Area: 22832333 Area % 0.35

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-ethyl-2,4-dimethyl-	120736	000874-41-9	94
2 Benzene, 1-ethyl-2,3-dimethyl-	120728	000933-98-2	94

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

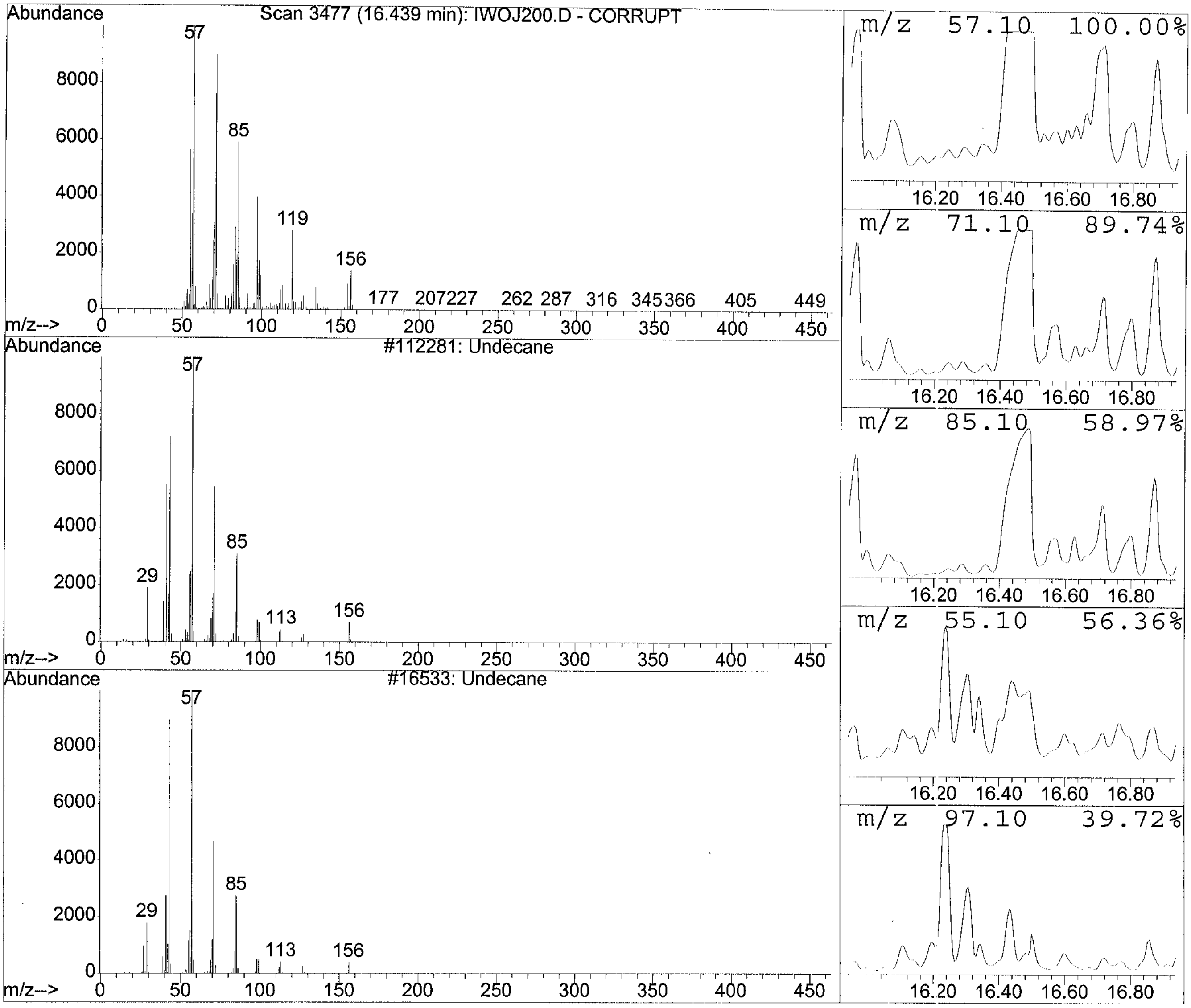


Peak Number: 45 at 16.31 min Area: 115053331 Area % 1.77

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 2-ethyl-1,4-dimethyl-	120830	001758-88-9	91
2 Benzene, 1-ethyl-2,3-dimethyl-	120728	000933-98-2	90

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

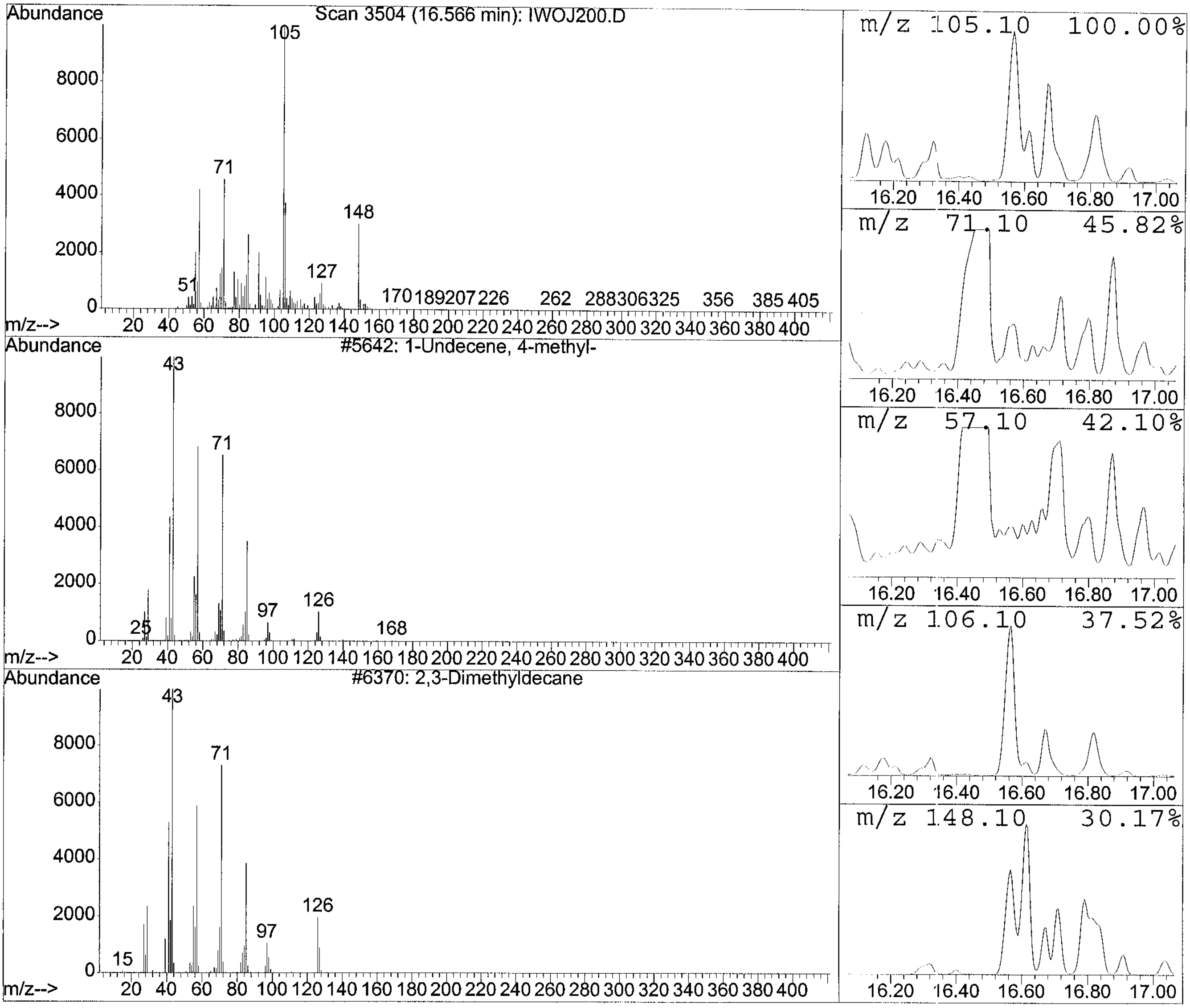


Peak Number: 46 at 16.44 min Area: 97059884 Area % 1.50

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Undecane	112281	001120-21-4	83
2 Undecane	16533	001120-21-4	64

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

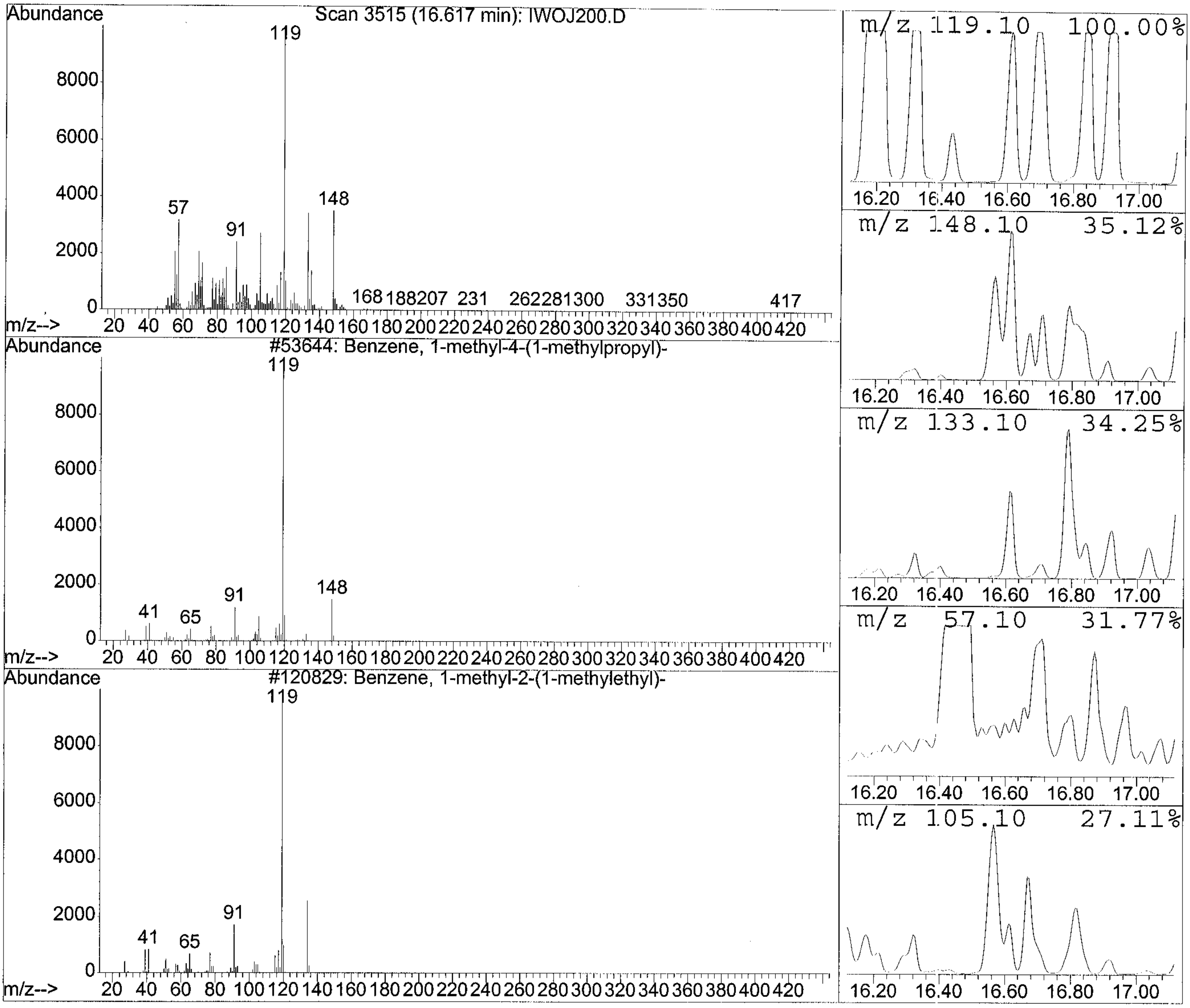


Peak Number: 47 at 16.57 min Area: 44175626 Area % 0.68

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Undecene, 4-methyl-	5642	074630-39-0	46
2 2,3-Dimethyldecane	6370	017312-44-6	35

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

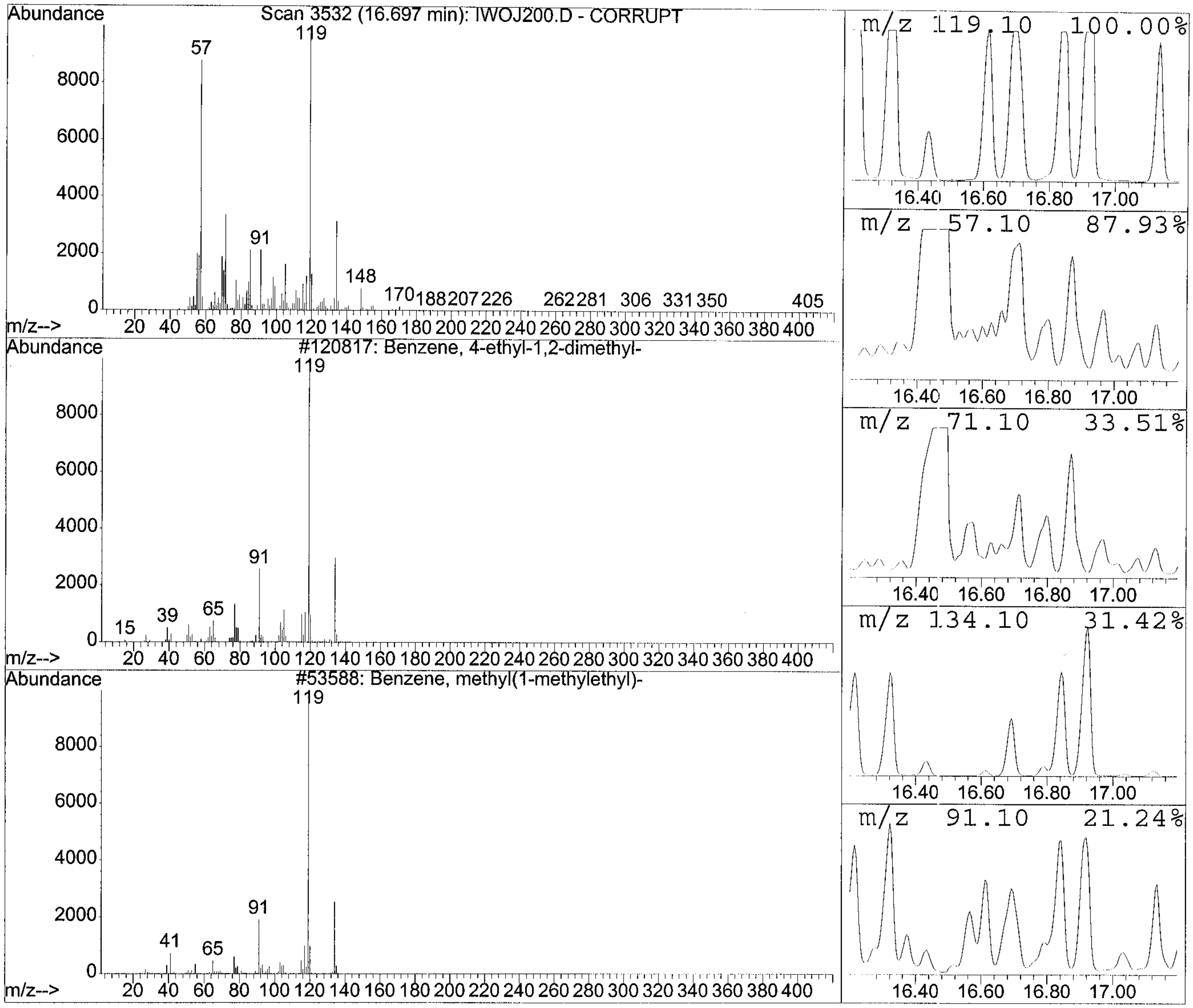


Peak Number: 48 at 16.62 min Area: 62746063 Area % 0.97

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-methyl-4-(1-methylpropyl	53644	001595-16-0	62
2 Benzene, 1-methyl-2-(1-methylethyl)	120829	000527-84-4	55

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

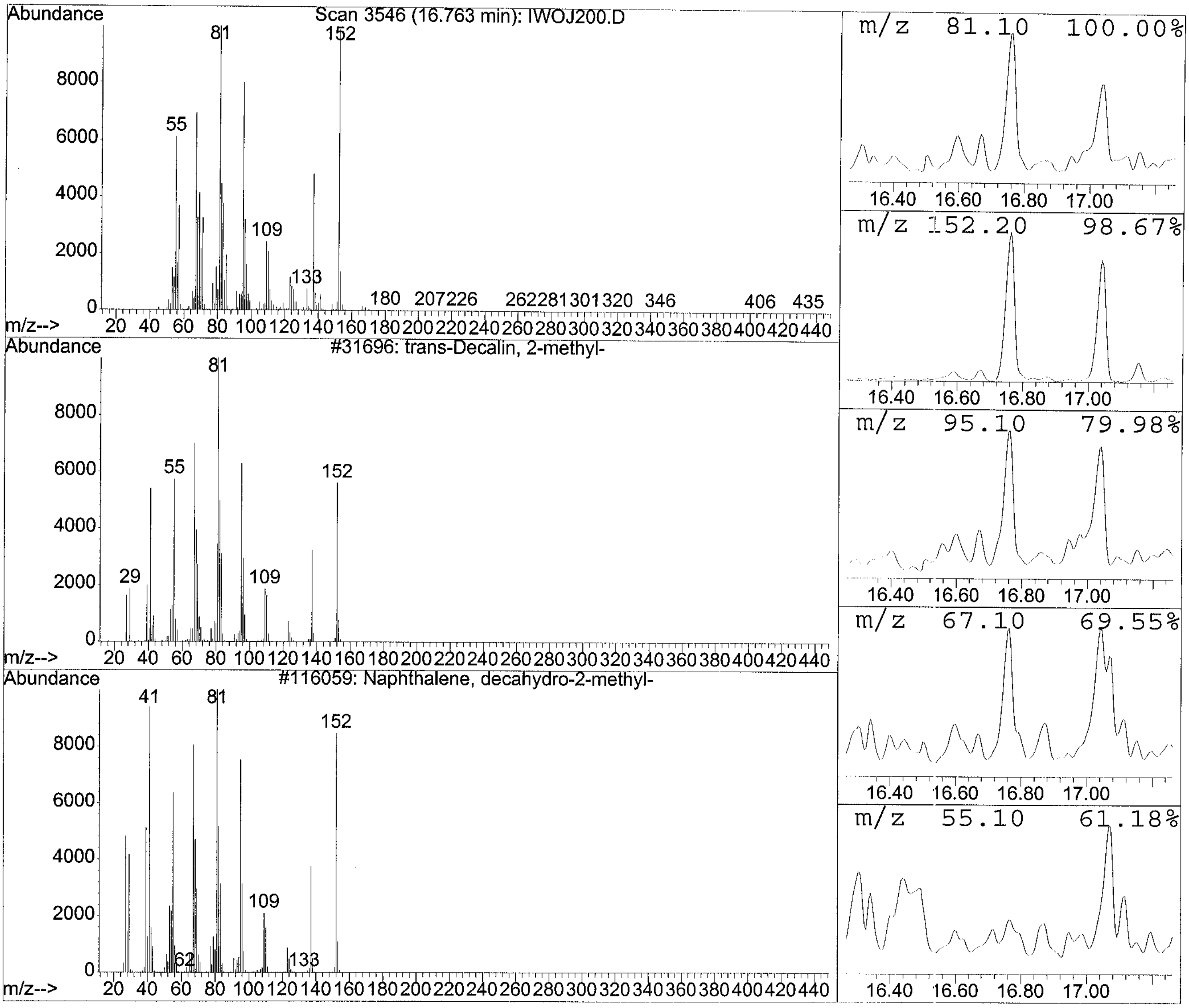


Peak Number: 49 at 16.70 min Area: 113048994 Area % 1.74

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 4-ethyl-1,2-dimethyl-	120817	000934-80-5	95
2 Benzene, methyl(1-methylethyl)-	53588	025155-15-1	90

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

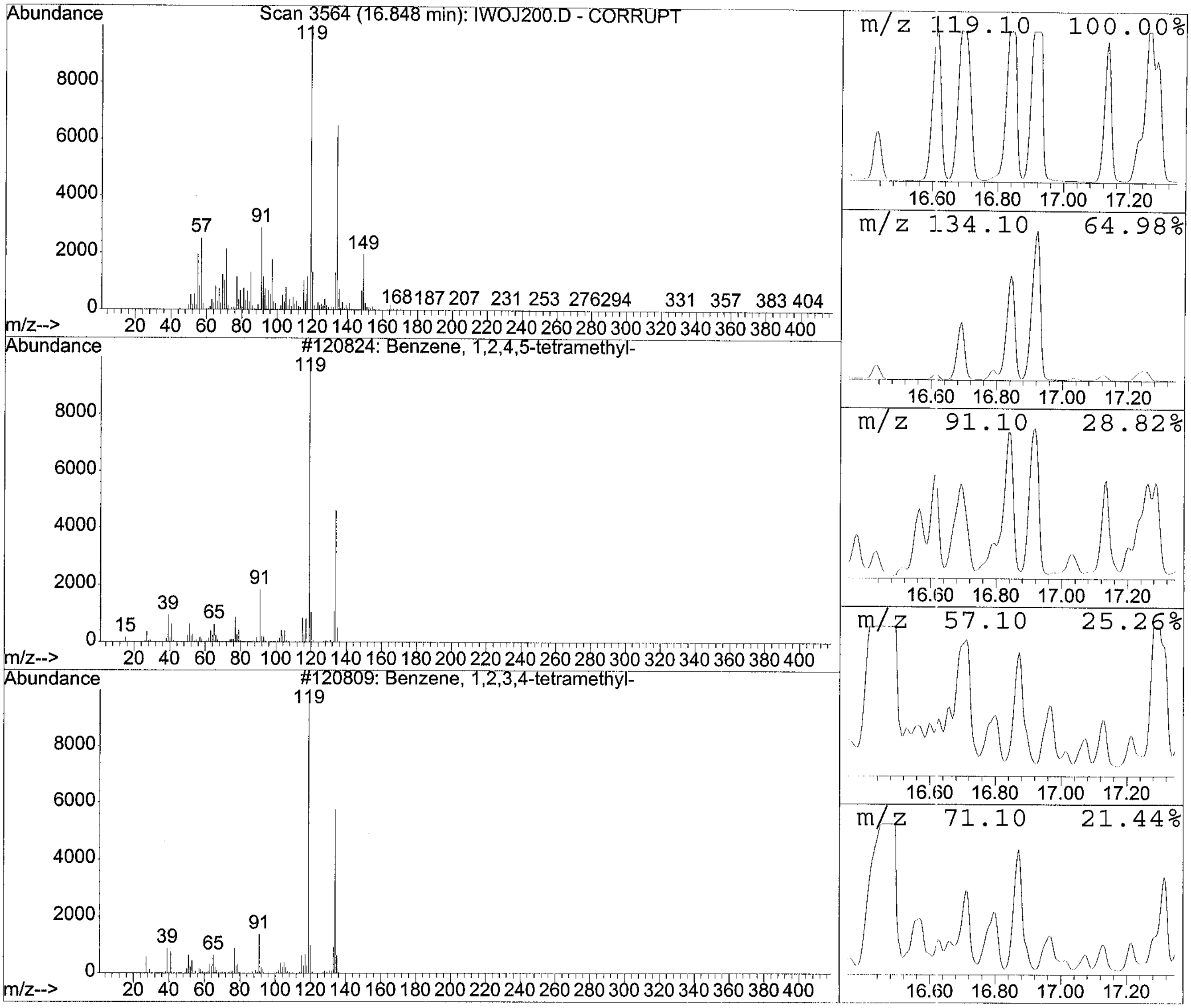


Peak Number: 50 at 16.76 min Area: 45716869 Area % 0.70

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 trans-Decalin, 2-methyl-	31696	1000152-47-3	97
2 Naphthalene, decahydro-2-methyl-	116059	002958-76-1	96

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

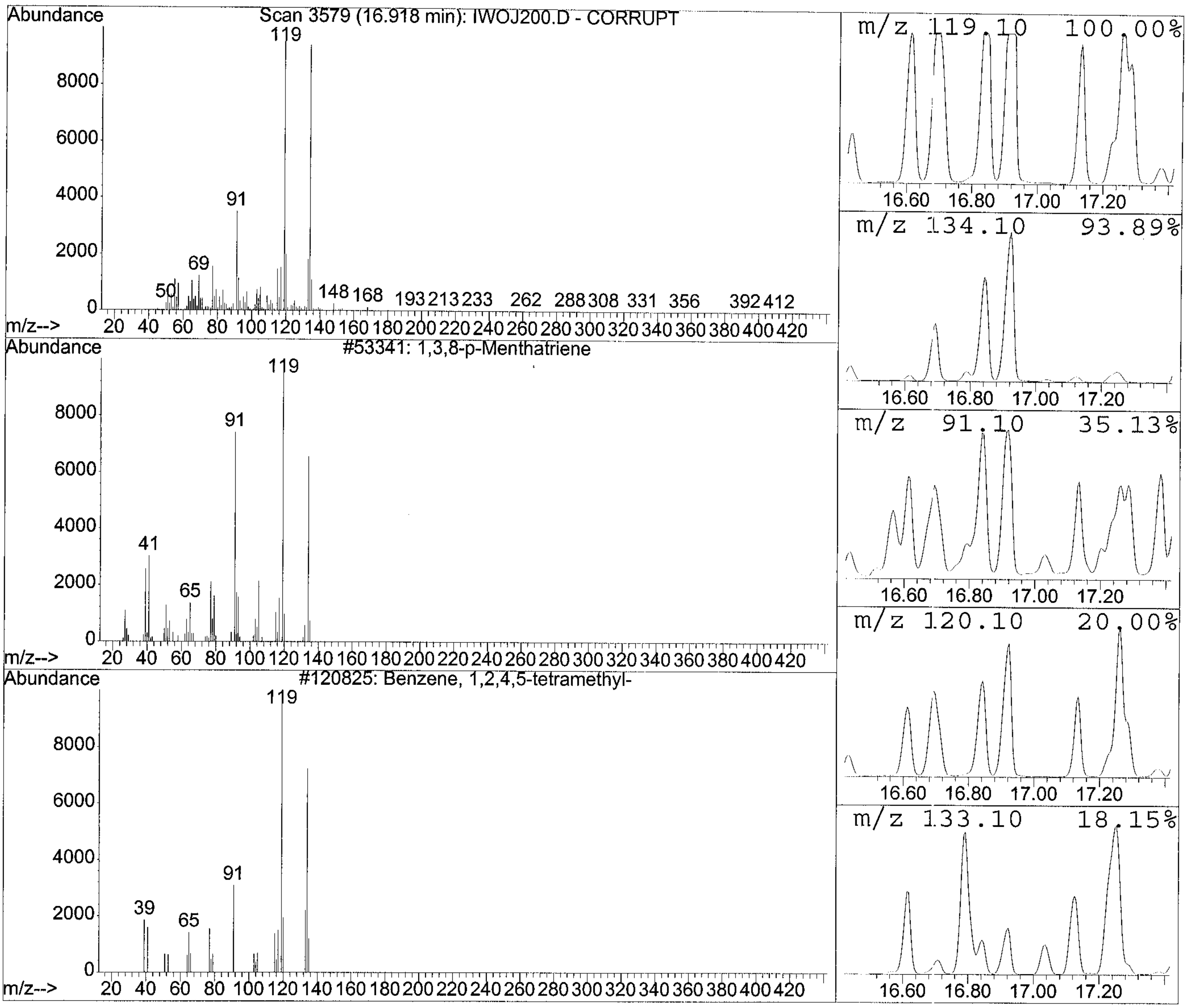


Peak Number: 51 at 16.85 min Area: 68041239 Area % 1.05

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,2,4,5-tetramethyl-	120824	000095-93-2	93
2 Benzene, 1,2,3,4-tetramethyl-	120809	000488-23-3	92

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

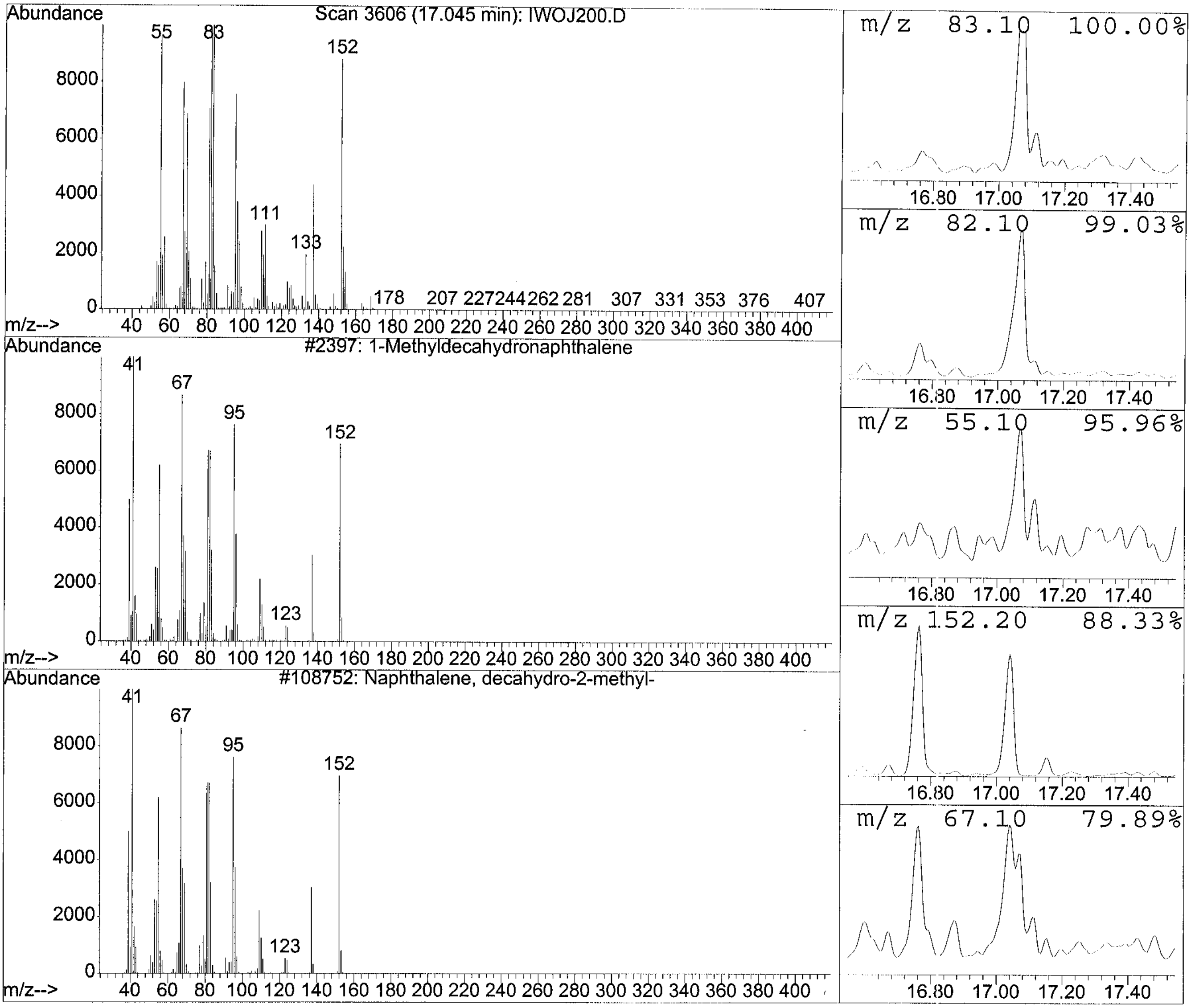


Peak Number: 52 at 16.92 min Area: 43869208 Area % 0.68

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1,3,8-p-Menthatriene	53341	021195-59-5	83
2 Benzene, 1,2,4,5-tetramethyl-	120825	000095-93-2	83

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

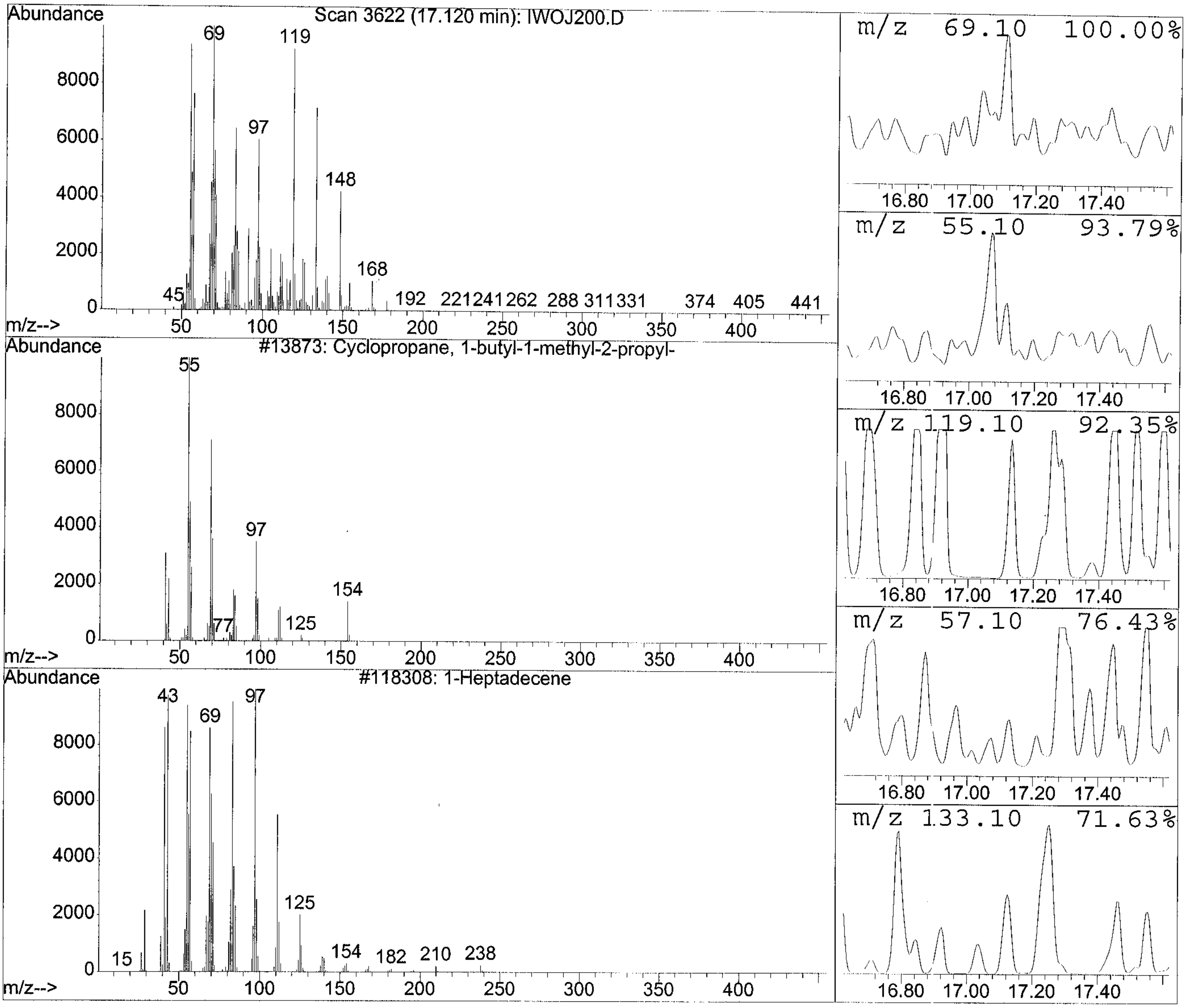


Peak Number: 53 at 17.05 min Area: 51726970 Area % 0.80

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Methyldecahydronaphthalene	2397	002958-75-0	70
2 Naphthalene, decahydro-2-methyl-	108752	002958-76-1	70

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

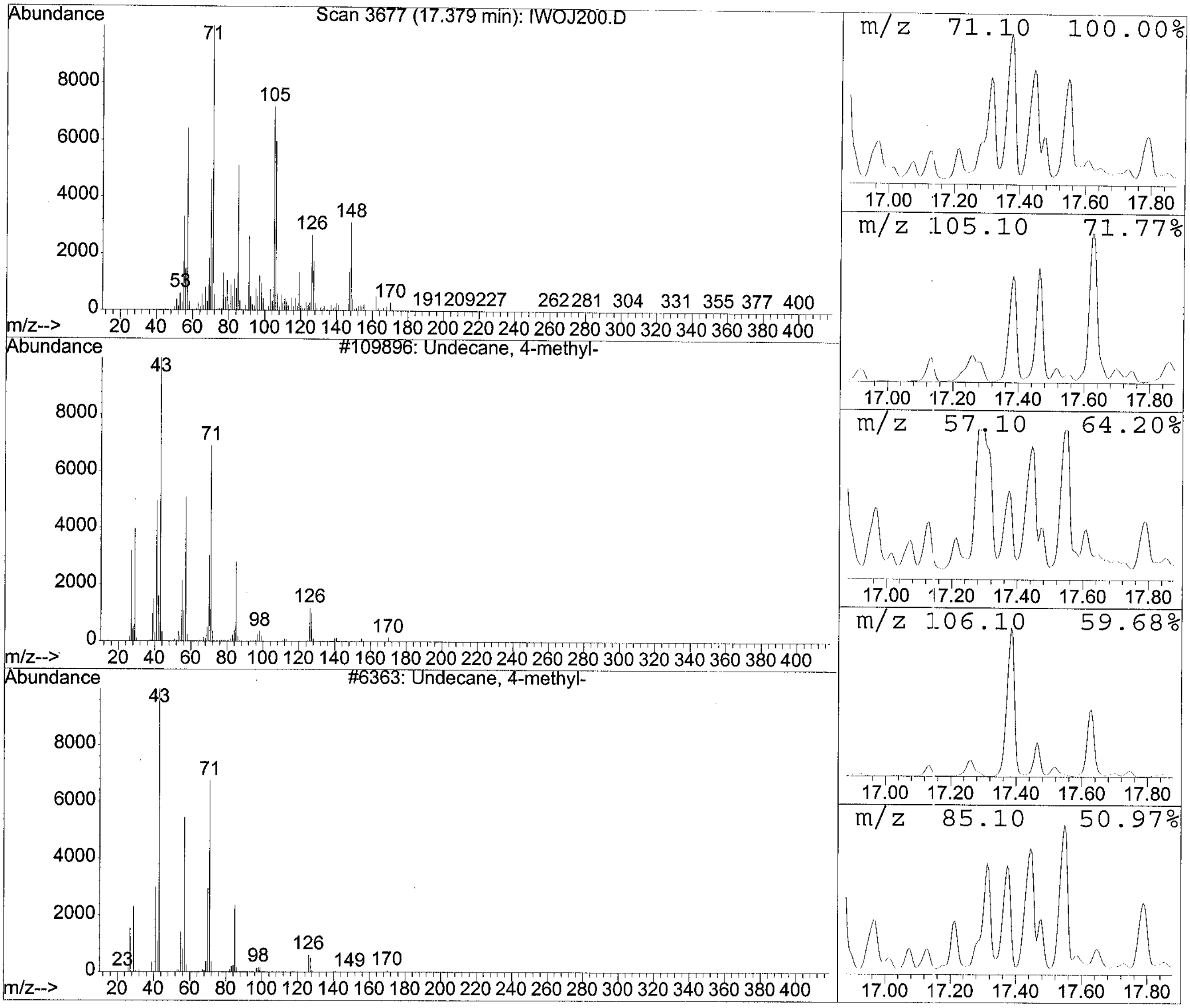


Peak Number: 54 at 17.12 min Area: 54769068 Area % 0.84

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclopropane, 1-butyl-1-methyl-2-pr	13873	041977-34-8	87
2 1-Heptadecene	118308	006765-39-5	70

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

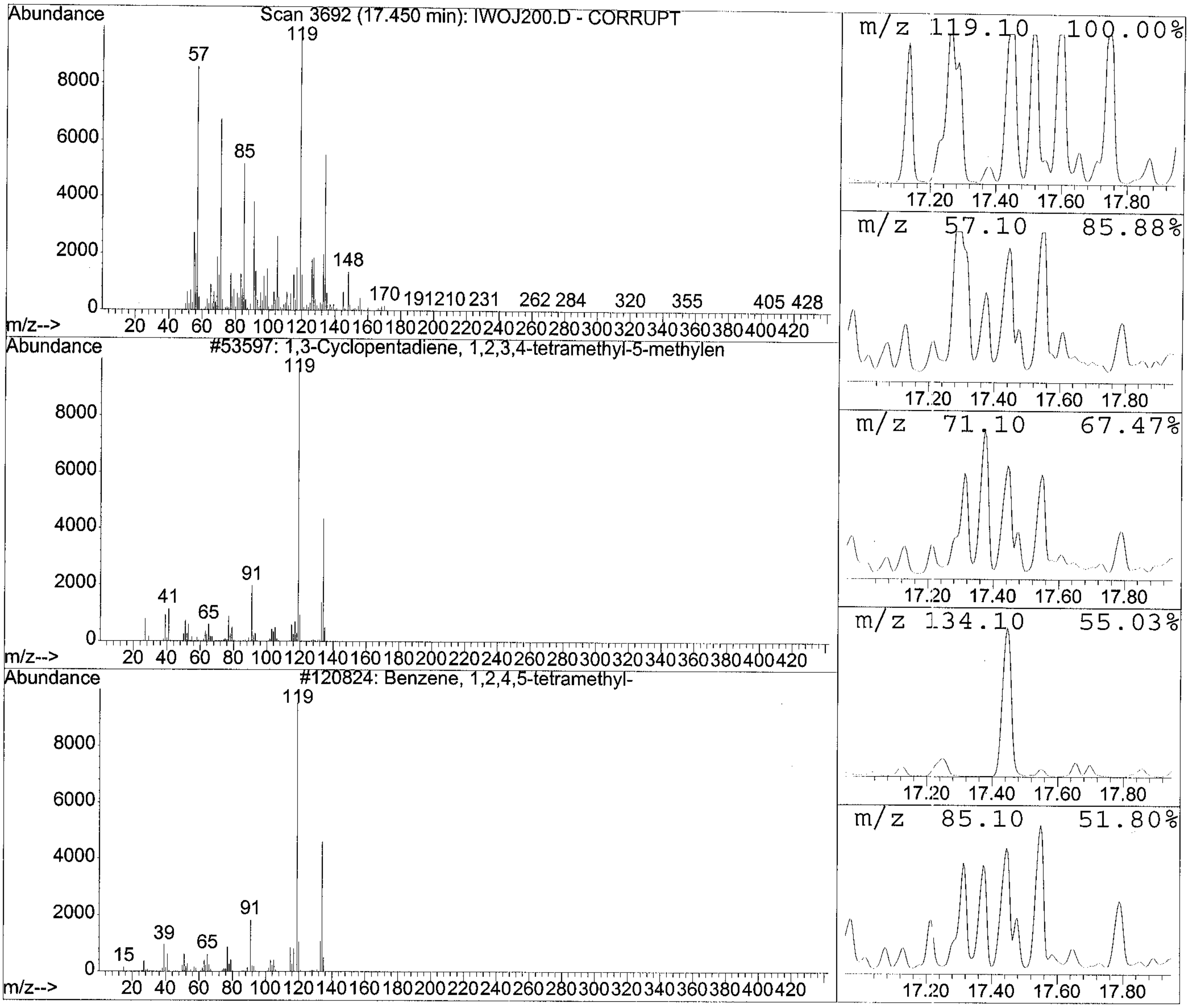


Peak Number: 55 at 17.38 min Area: 72653899 Area % 1.12

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Undecane, 4-methyl-	109896	002980-69-0	64
2 Undecane, 4-methyl-	6363	002980-69-0	62

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

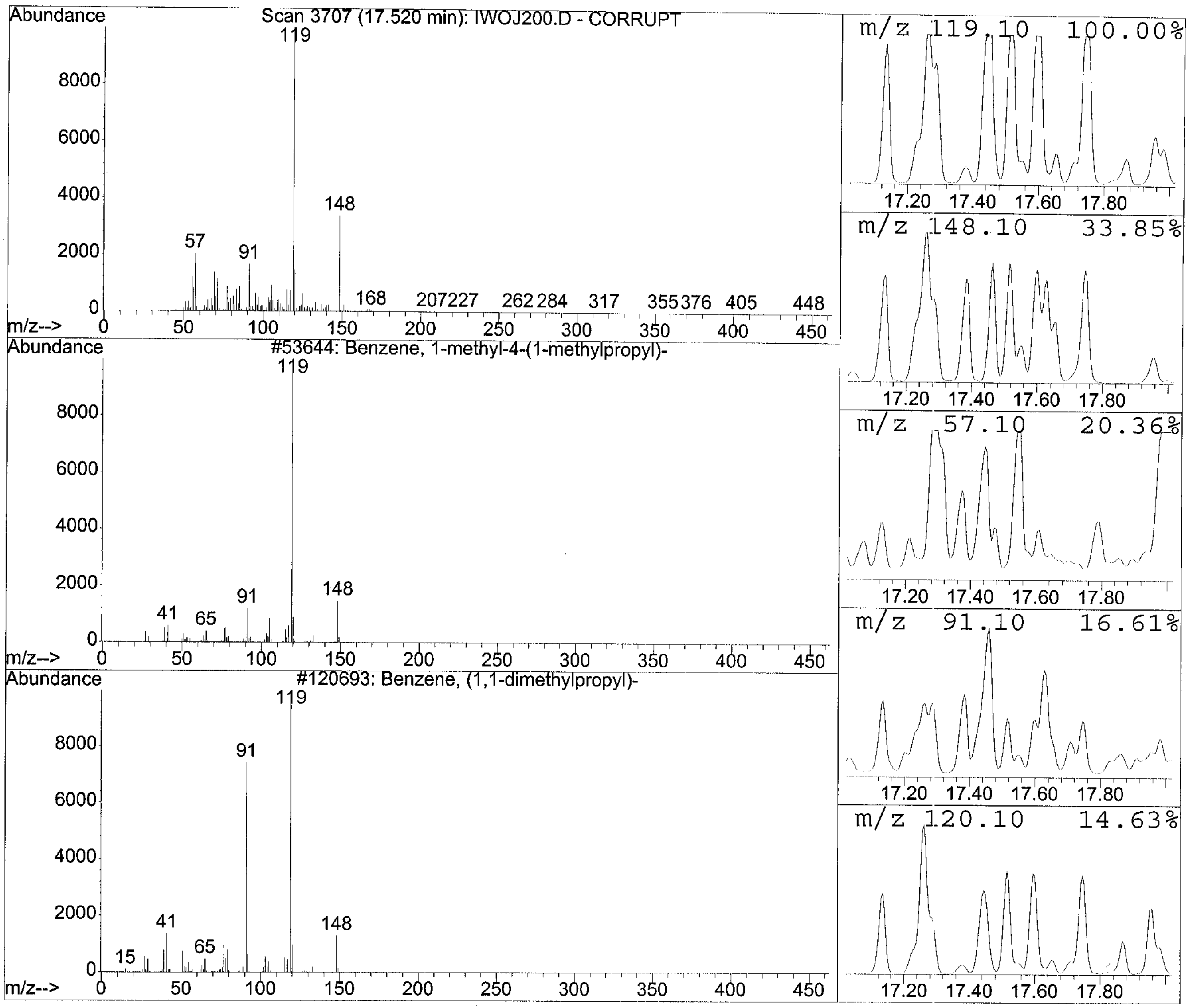


Peak Number: 56 at 17.45 min Area: 173519436 Area % 2.67

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1,3-Cyclopentadiene, 1,2,3,4-tetram	53597	076089-59-3	60
2 Benzene, 1,2,4,5-tetramethyl-	120824	000095-93-2	55

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

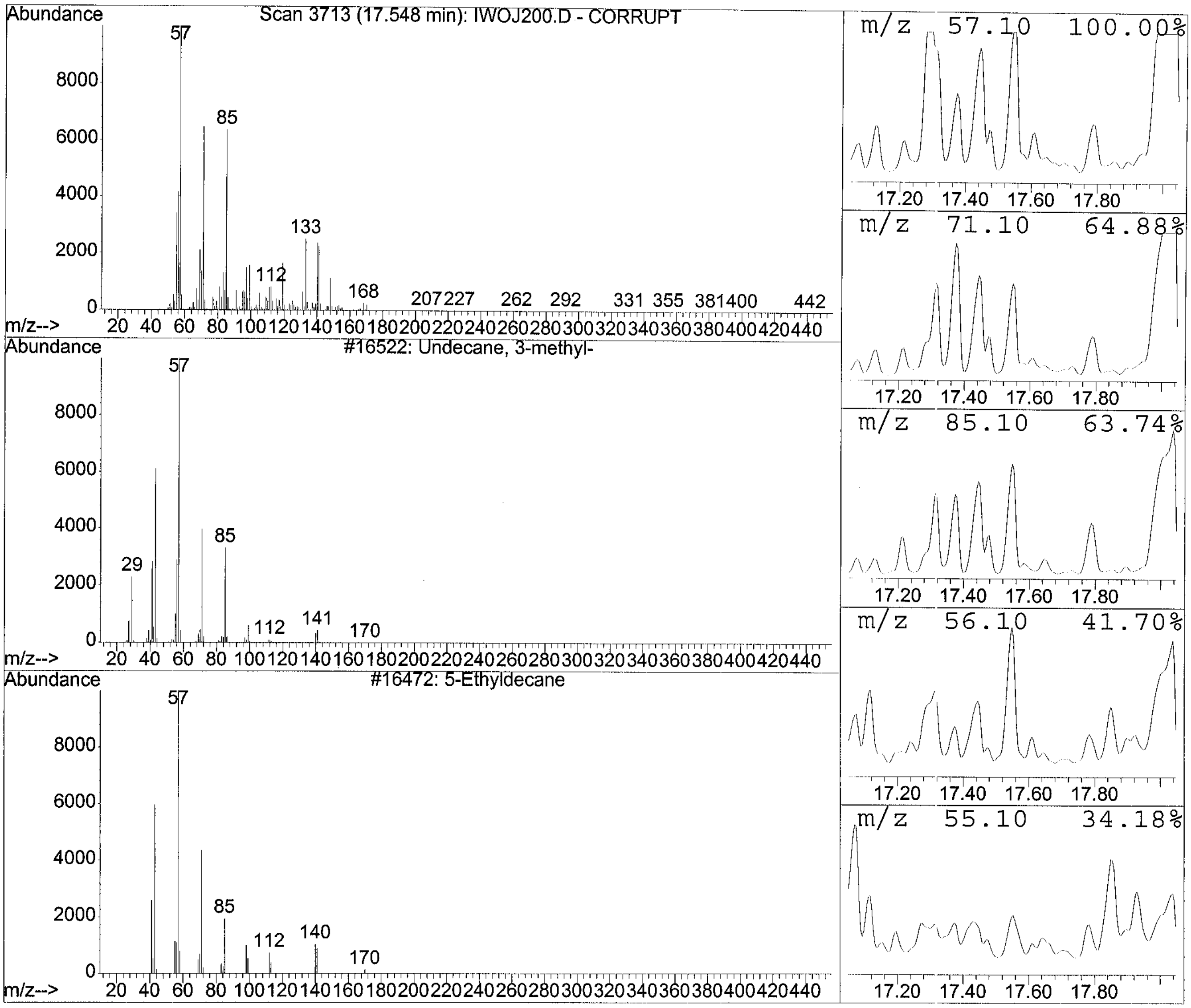


Peak Number: 57 at 17.52 min Area: 29285289 Area % 0.45

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-methyl-4-(1-methylpropyl	53644	001595-16-0	93
2 Benzene, (1,1-dimethylpropyl)-	120693	002049-95-8	72

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

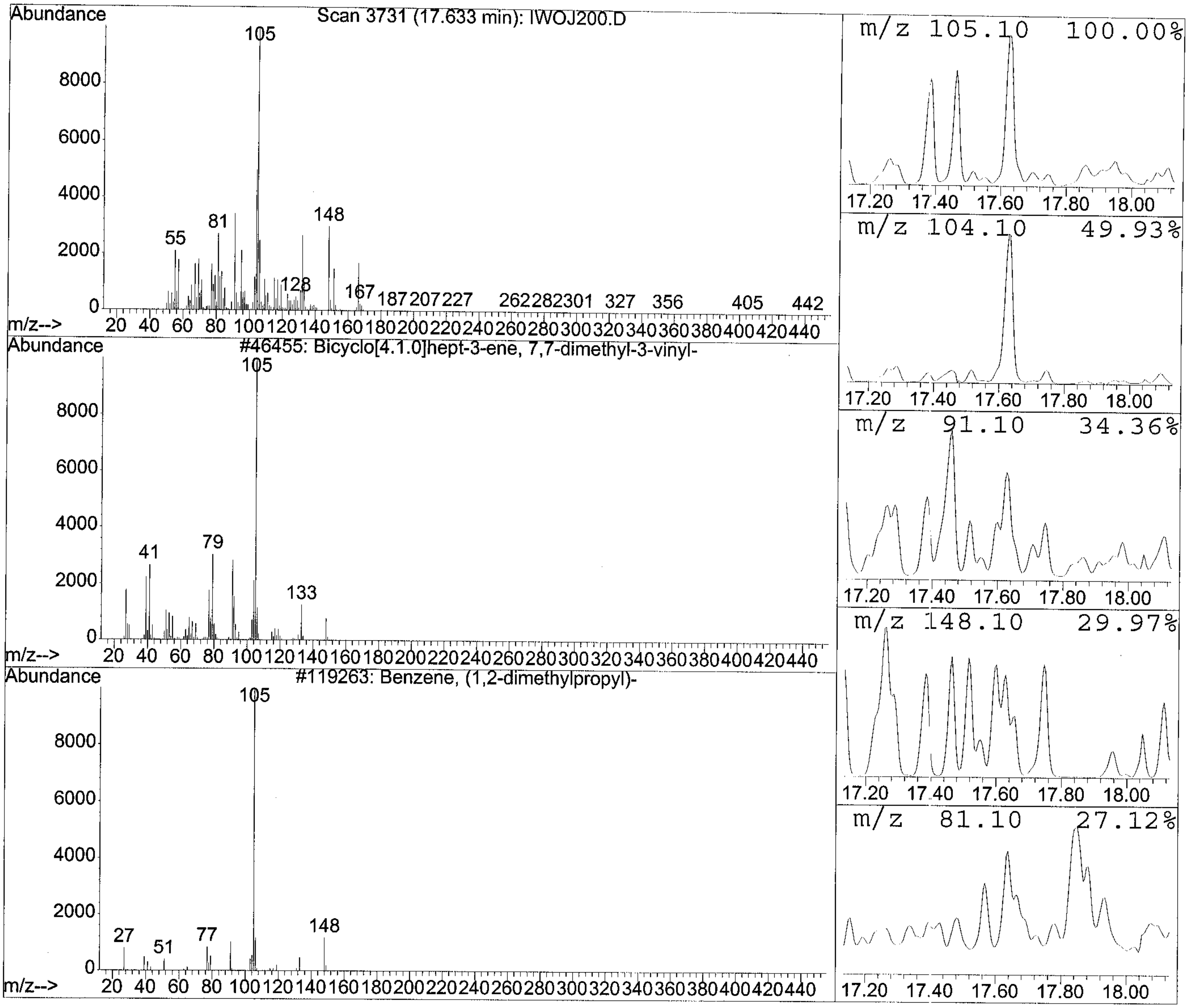


Peak Number: 58 at 17.55 min Area: 51088988 Area % 0.79

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Undecane, 3-methyl-	16522	001002-43-3	53
2 5-Ethyldecane	16472	017302-36-2	49

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

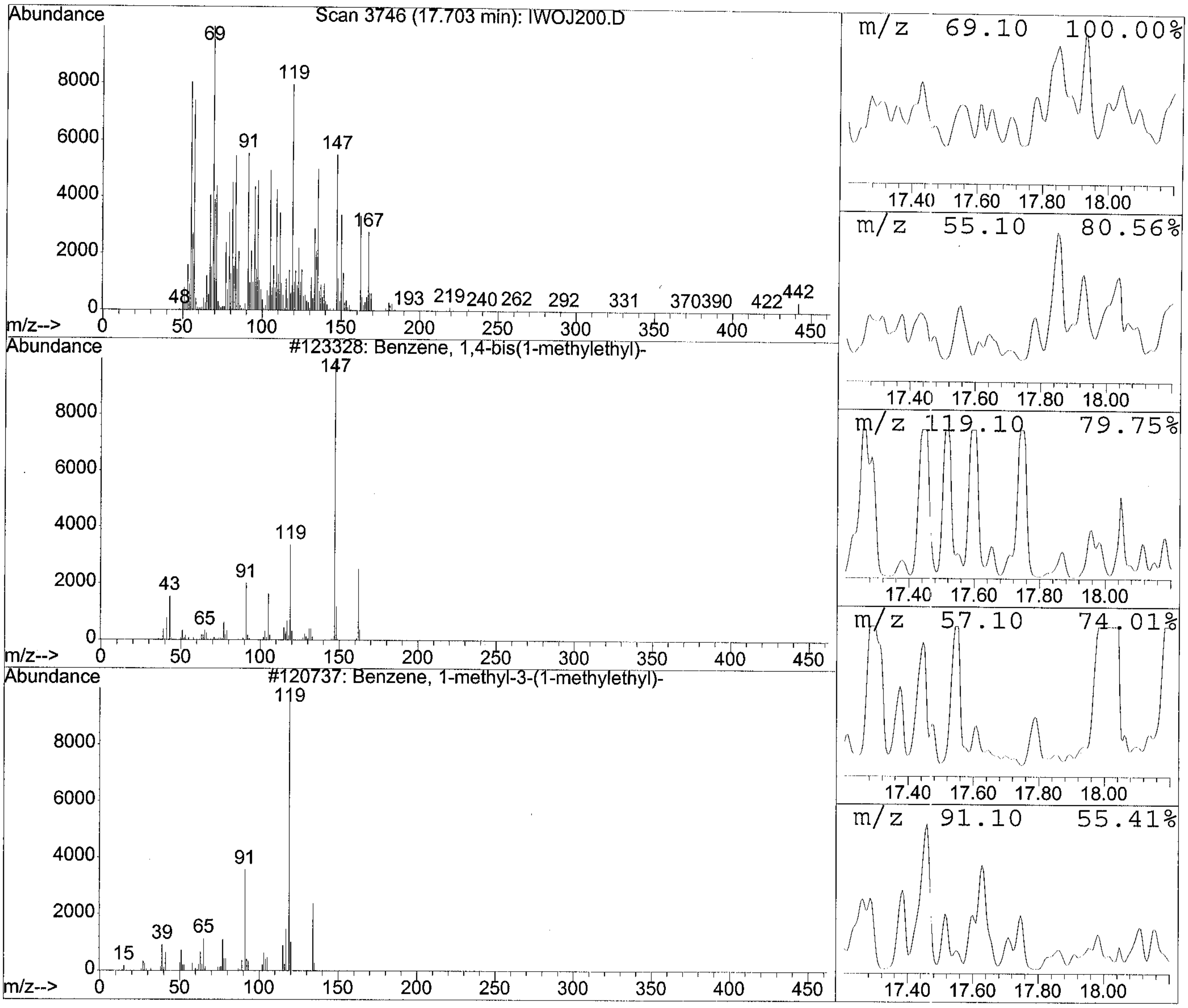


Peak Number: 59 at 17.63 min Area: 120608615 Area % 1.86

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Bicyclo[4.1.0]hept-3-ene, 7,7-dimet	46455	113003-13-7	32
2 Benzene, (1,2-dimethylpropyl)-	119263	004481-30-5	25

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

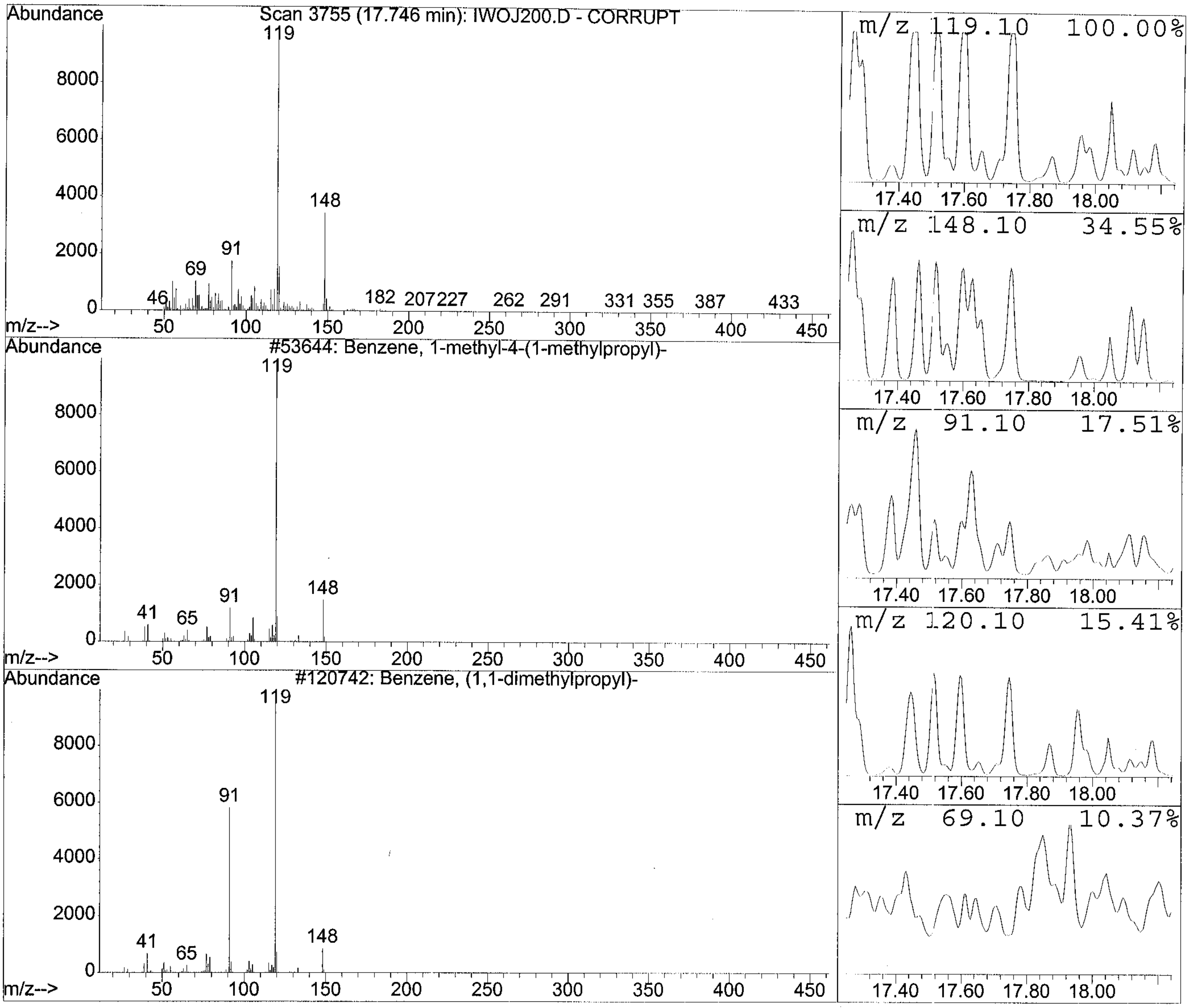


Peak Number: 60 at 17.70 min Area: 15665903 Area % 0.24

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1,4-bis(1-methylethyl)-	123328	000100-18-5	38
2 Benzene, 1-methyl-3-(1-methylethyl)	120737	000535-77-3	25

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

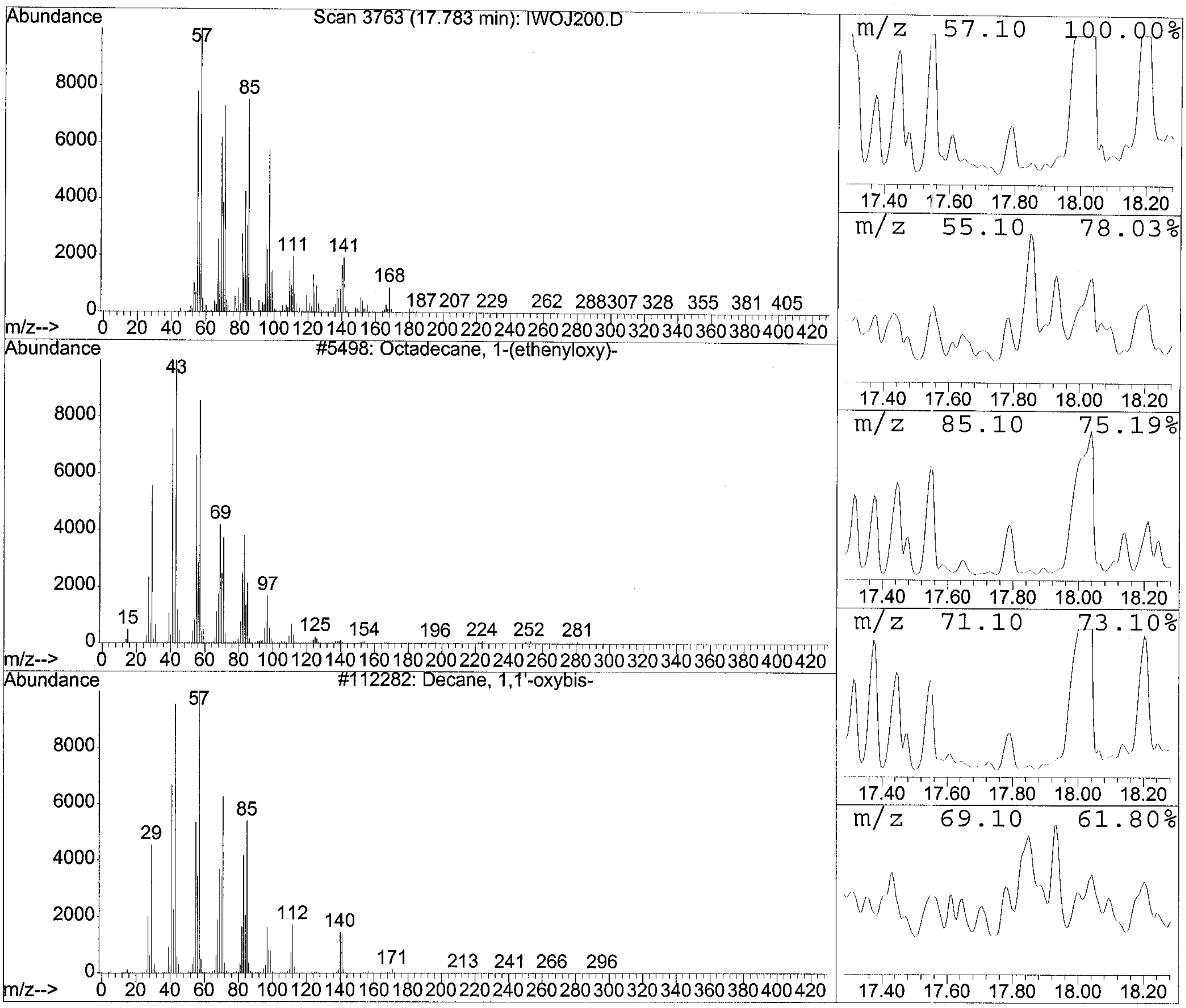


Peak Number: 61 at 17.75 min Area: 14878392 Area % 0.23

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-methyl-4-(1-methylpropyl	53644	001595-16-0	87
2 Benzene, (1,1-dimethylpropyl)-	120742	002049-95-8	72

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

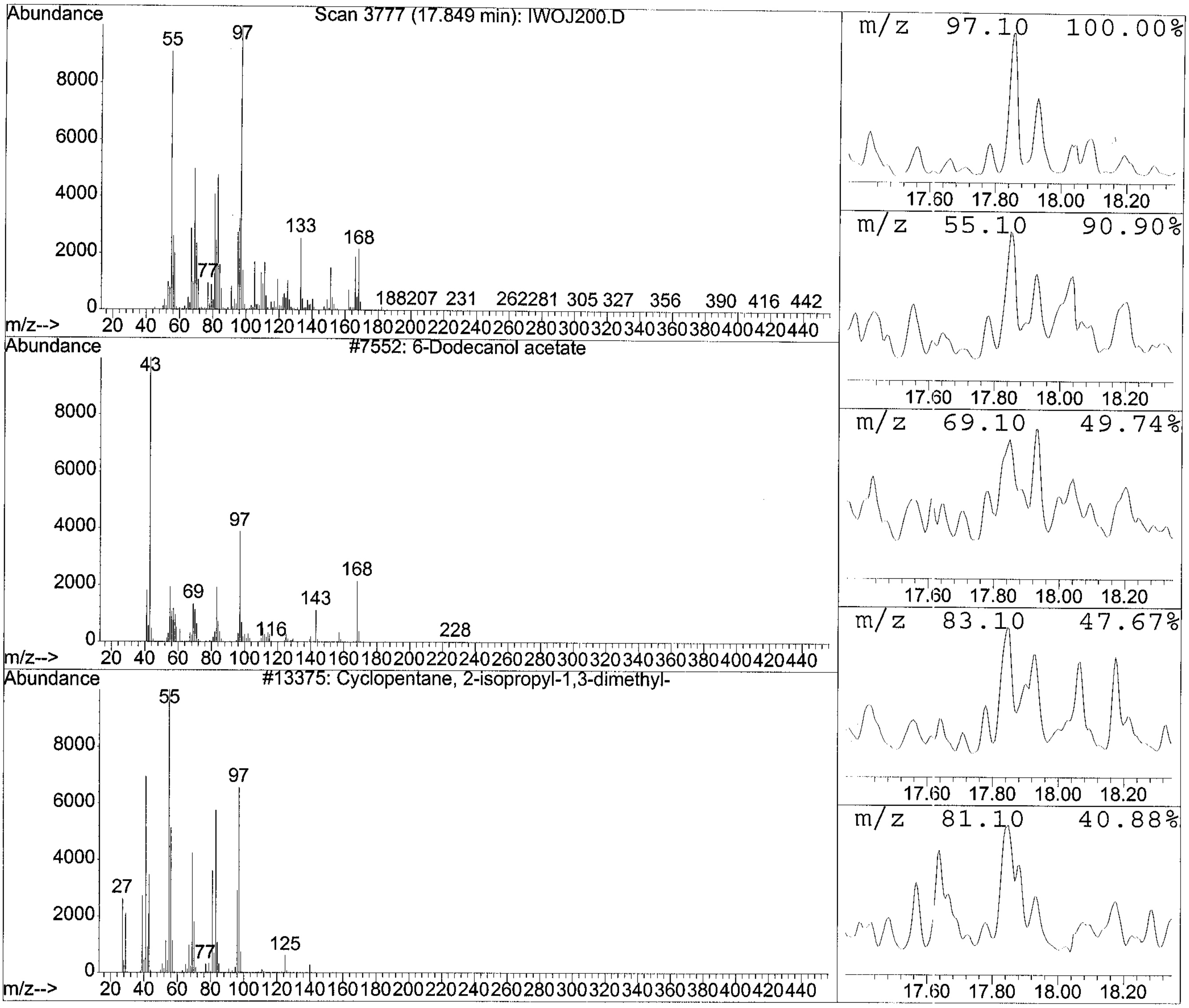


Peak Number: 62 at 17.78 min Area: 22447009 Area % 0.35

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Octadecane, 1-(ethenyloxy)-	5498	000930-02-9	83
2 Decane, 1,1'-oxybis-	112282	002456-28-2	64

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

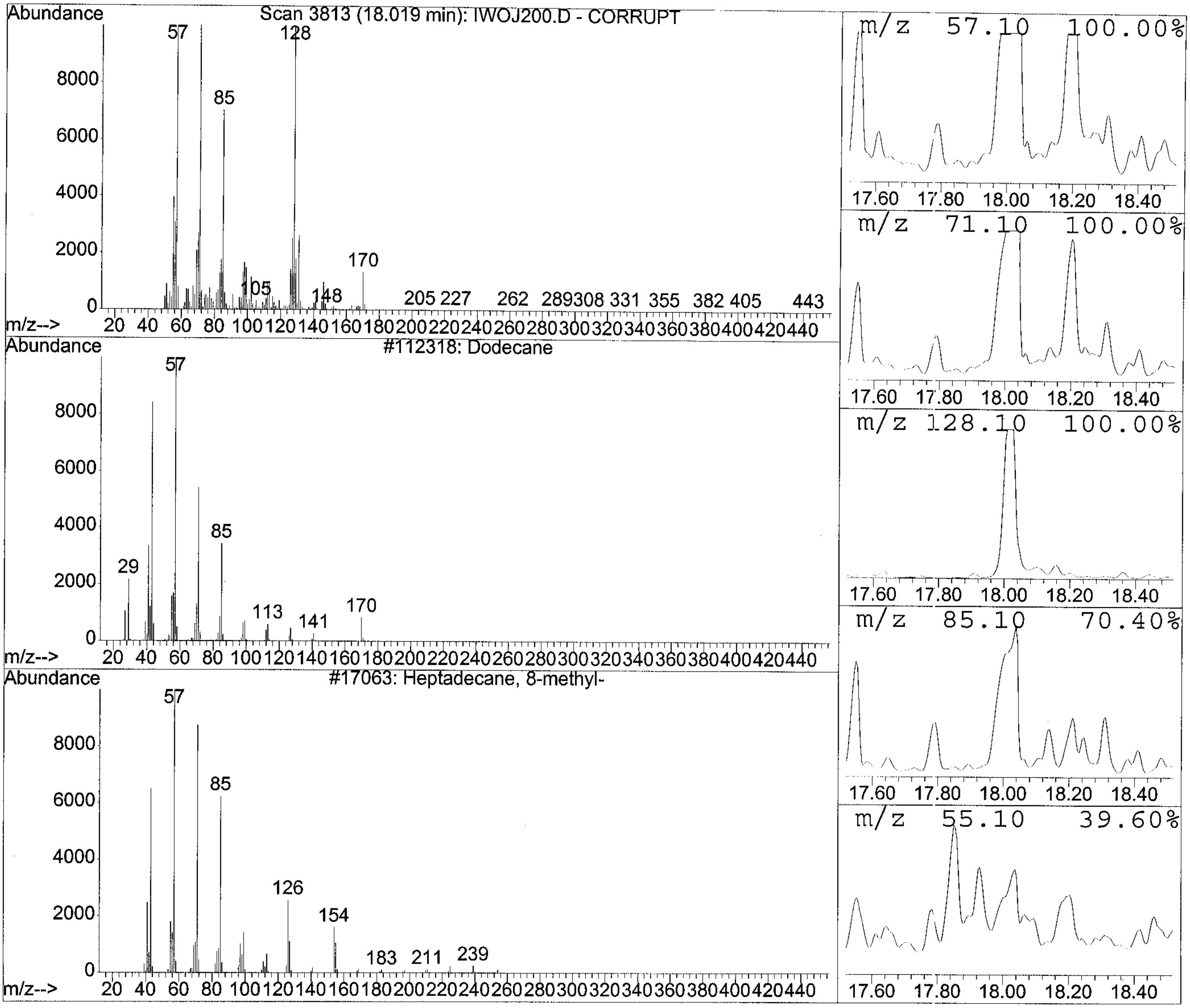


Peak Number: 63 at 17.85 min Area: 99964256 Area % 1.54

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 6-Dodecanol acetate	7552	1000131-32-1	43
2 Cyclopentane, 2-isopropyl-1,3-dimet	13375	032281-85-9	38

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

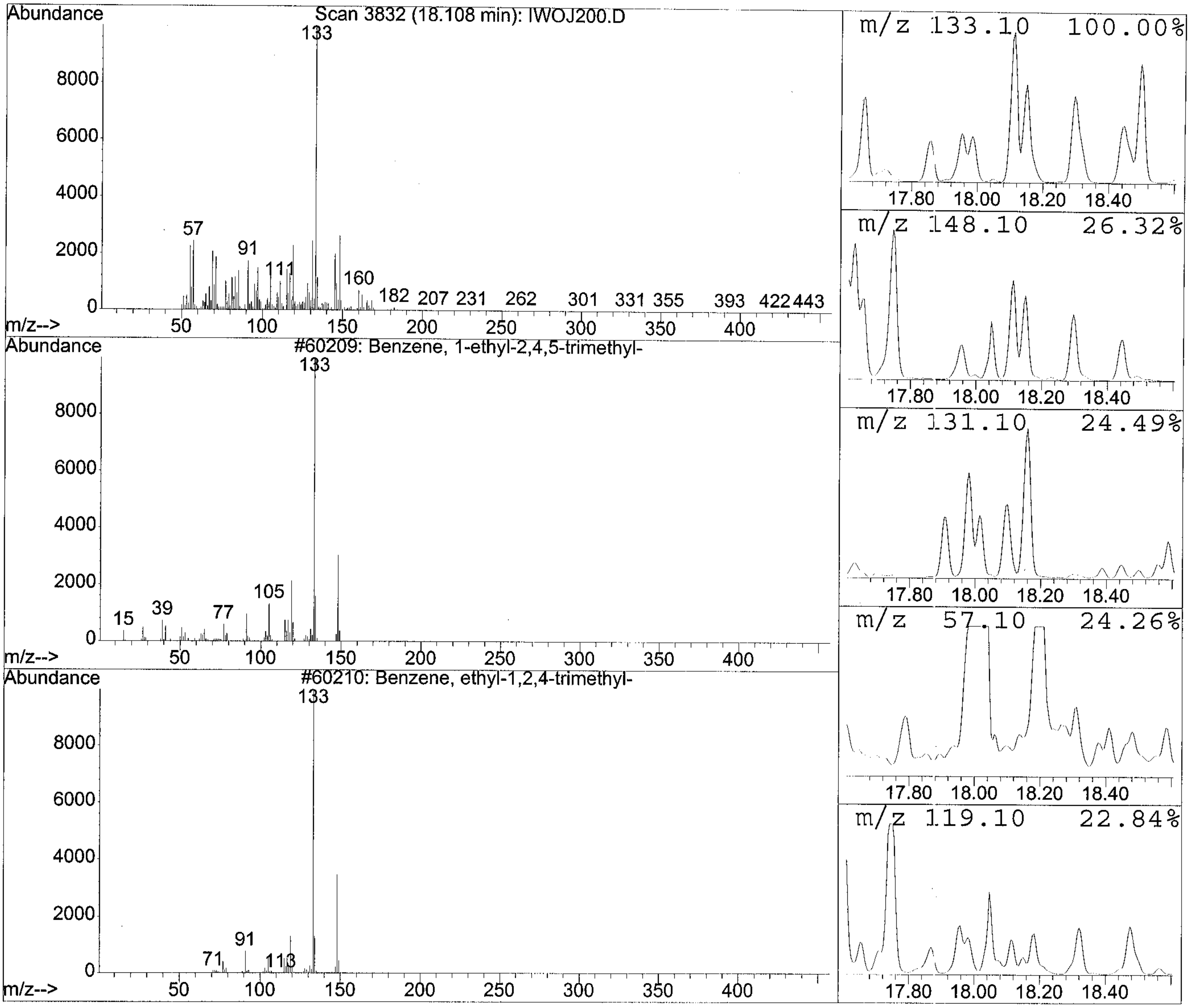


Peak Number: 64 at 18.02 min Area: 189952101 Area % 2.93

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Dodecane	112318	000112-40-3	50
2 Heptadecane, 8-methyl-	17063	013287-23-5	50

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

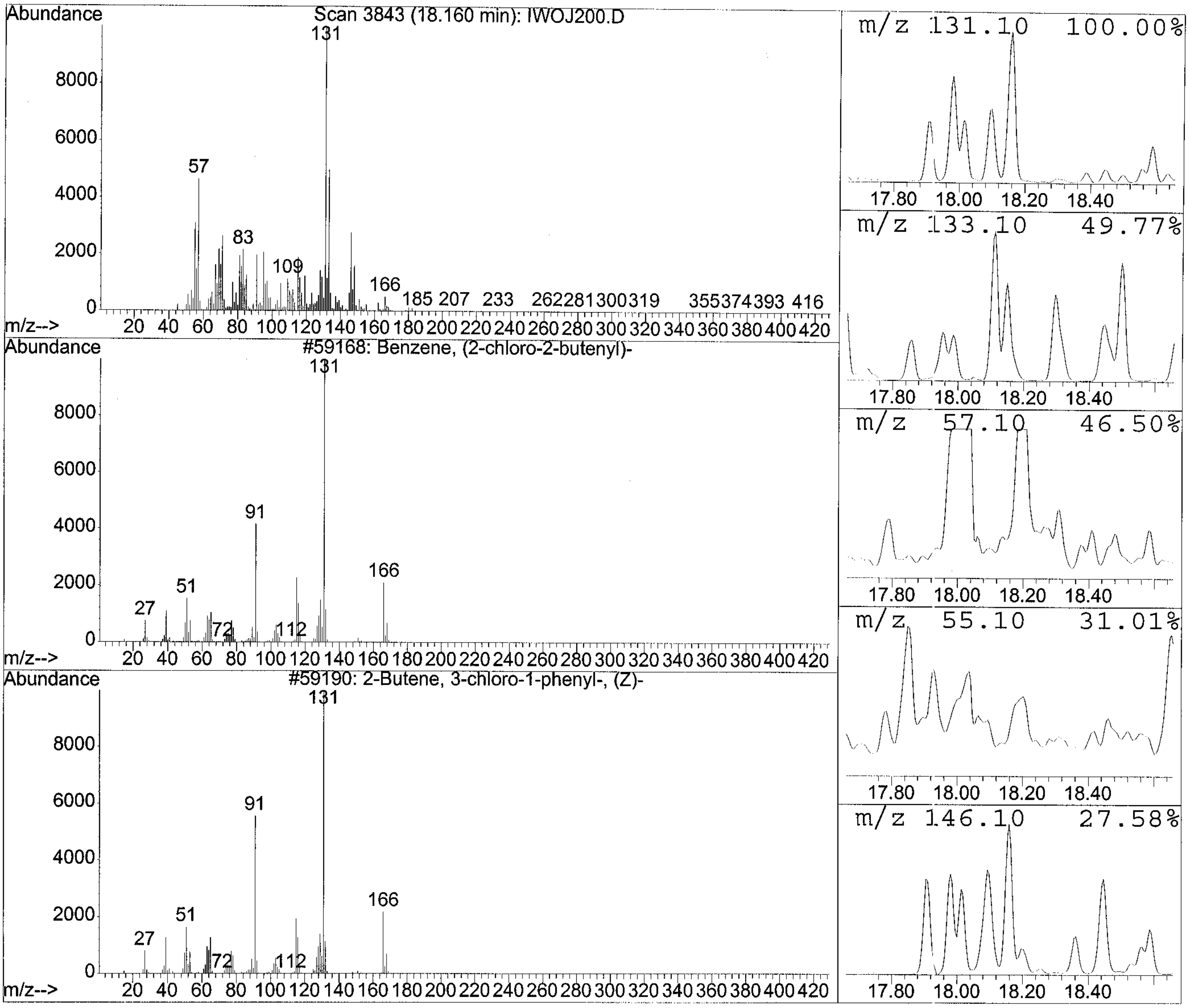


Peak Number: 65 at 18.11 min Area: 27024480 Area % 0.42

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-ethyl-2,4,5-trimethyl-	60209	017851-27-3	64
2 Benzene, ethyl-1,2,4-trimethyl-	60210	054120-62-6	64

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

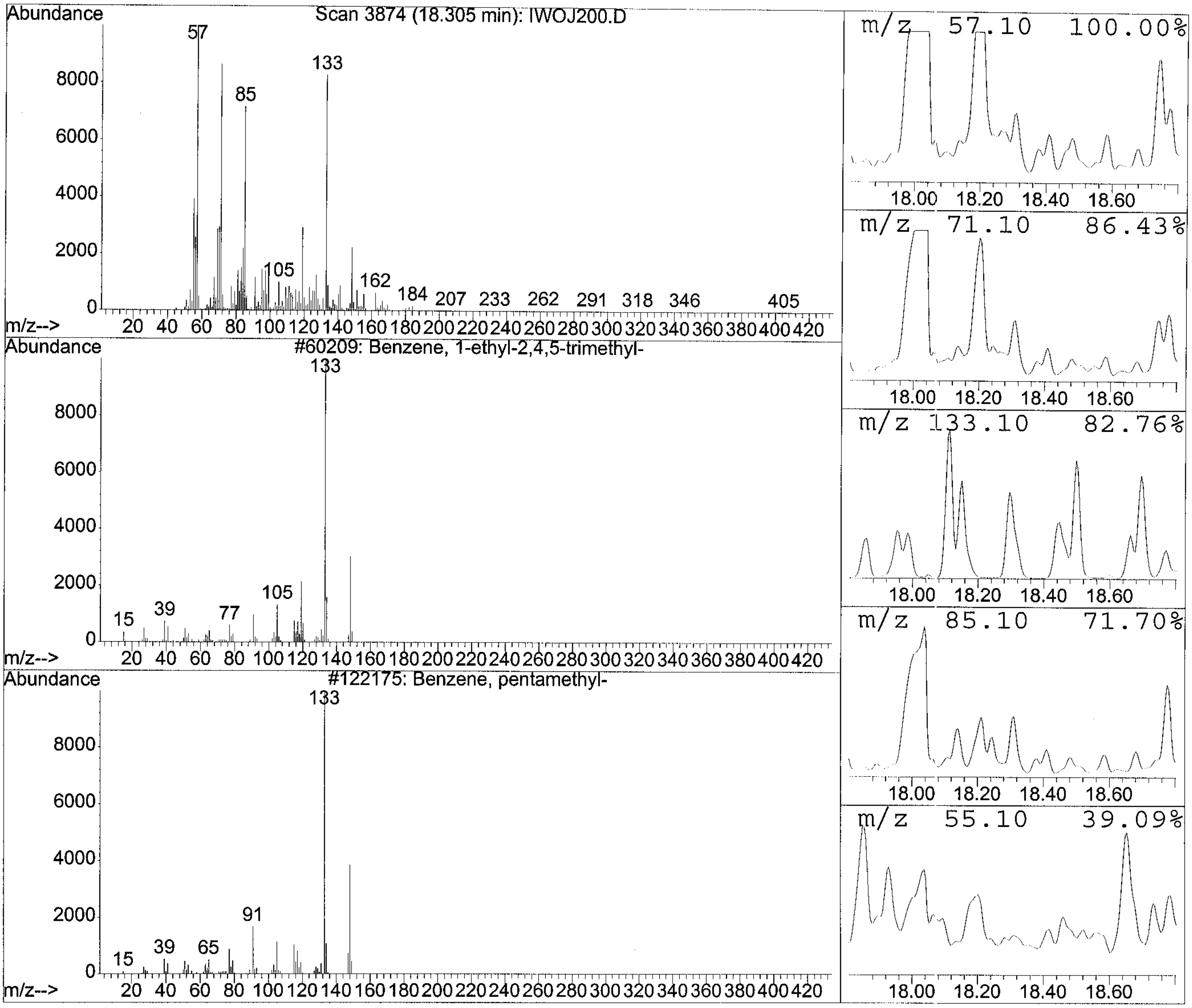


Peak Number: 66 at 18.16 min Area: 31201872 Area % 0.48

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, (2-chloro-2-butenyl)-	59168	054411-12-0	90
2 2-Butene, 3-chloro-1-phenyl-, (Z)-	59190	016608-68-7	90

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

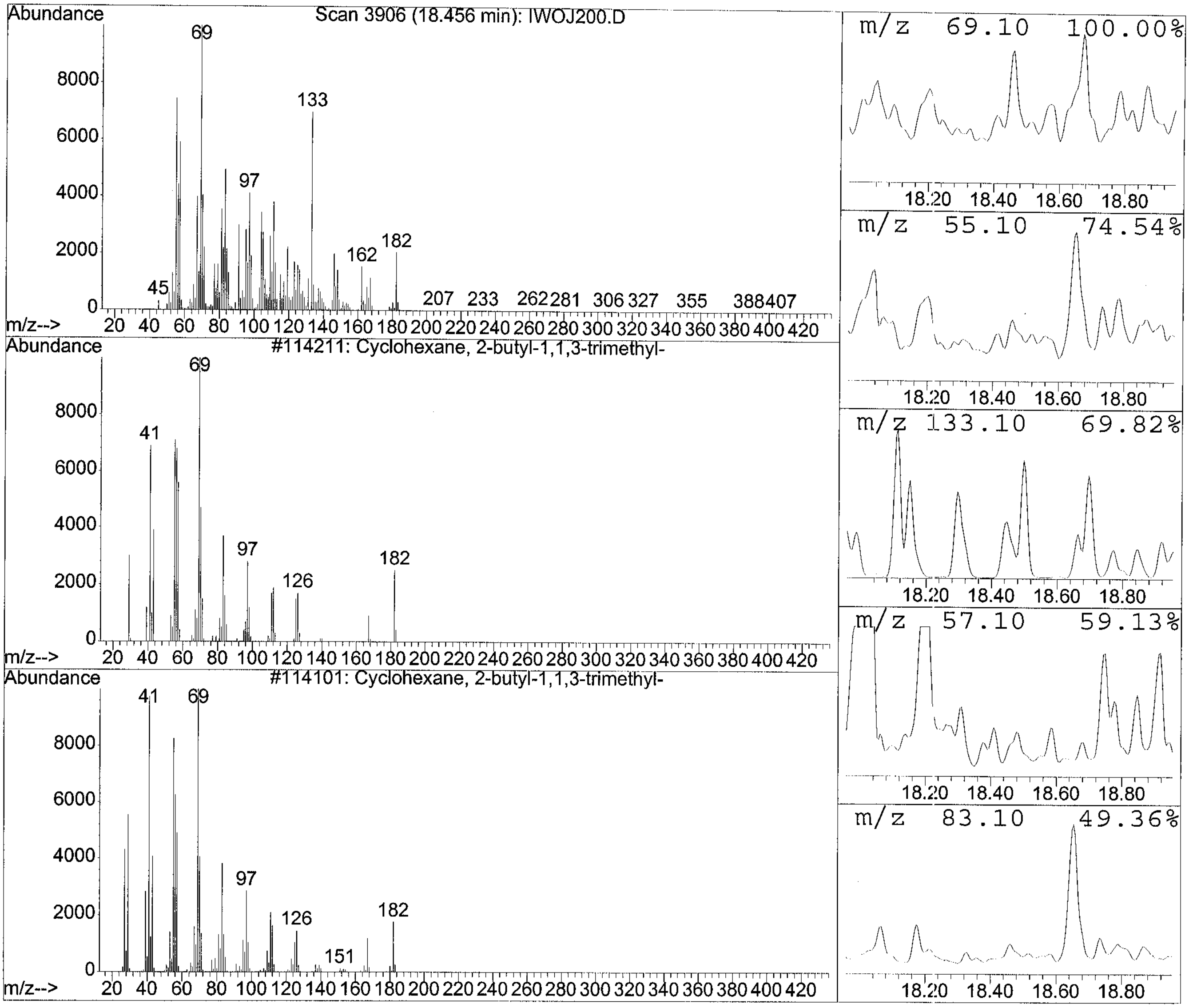


Peak Number: 67 at 18.31 min Area: 34166096 Area % 0.53

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Benzene, 1-ethyl-2,4,5-trimethyl-	60209	017851-27-3	83
2 Benzene, pentamethyl-	122175	000700-12-9	52

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

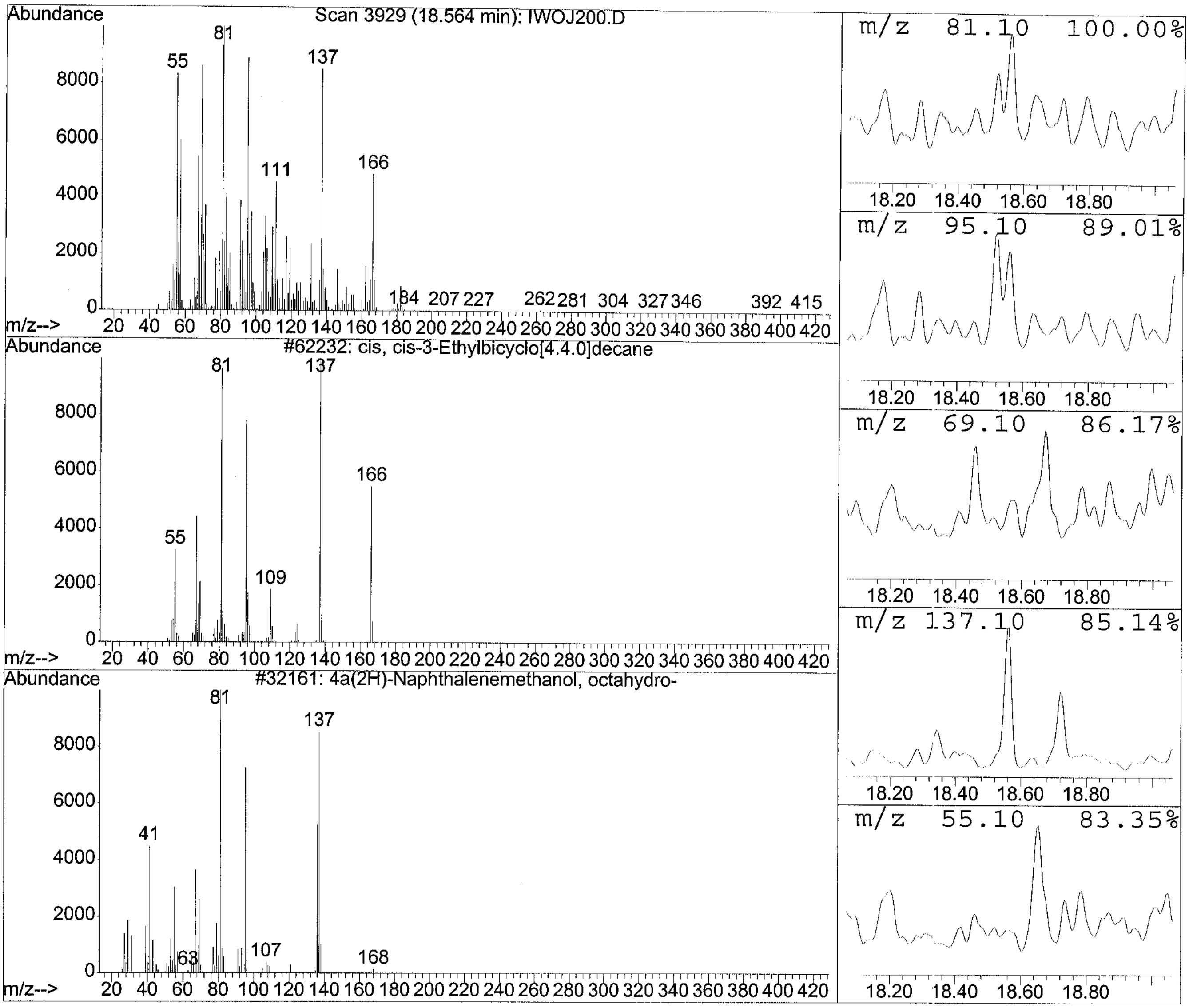


Peak Number: 68 at 18.46 min Area: 24485978 Area % 0.38

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, 2-butyl-1,1,3-trimethy	114211	054676-39-0	55
2 Cyclohexane, 2-butyl-1,1,3-trimethy	114101	054676-39-0	46

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

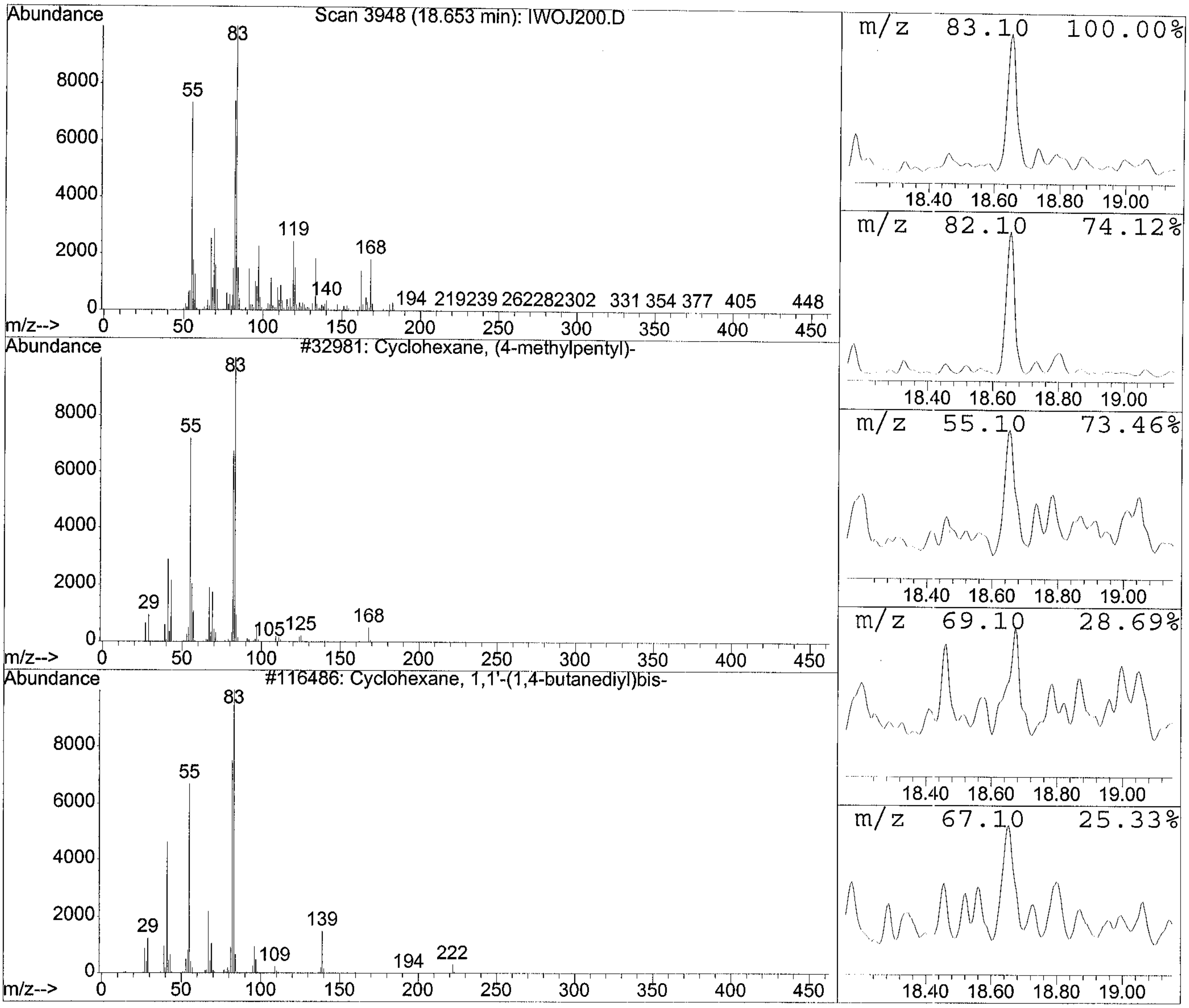


Peak Number: 69 at 18.56 min Area: 41641258 Area % 0.64

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 cis, cis-3-Ethylbicyclo[4.4.0]decan	62232	066660-42-2	91
2 4a(2H)-Naphthalenemethanol, octahyd	32161	099992-19-5	64

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

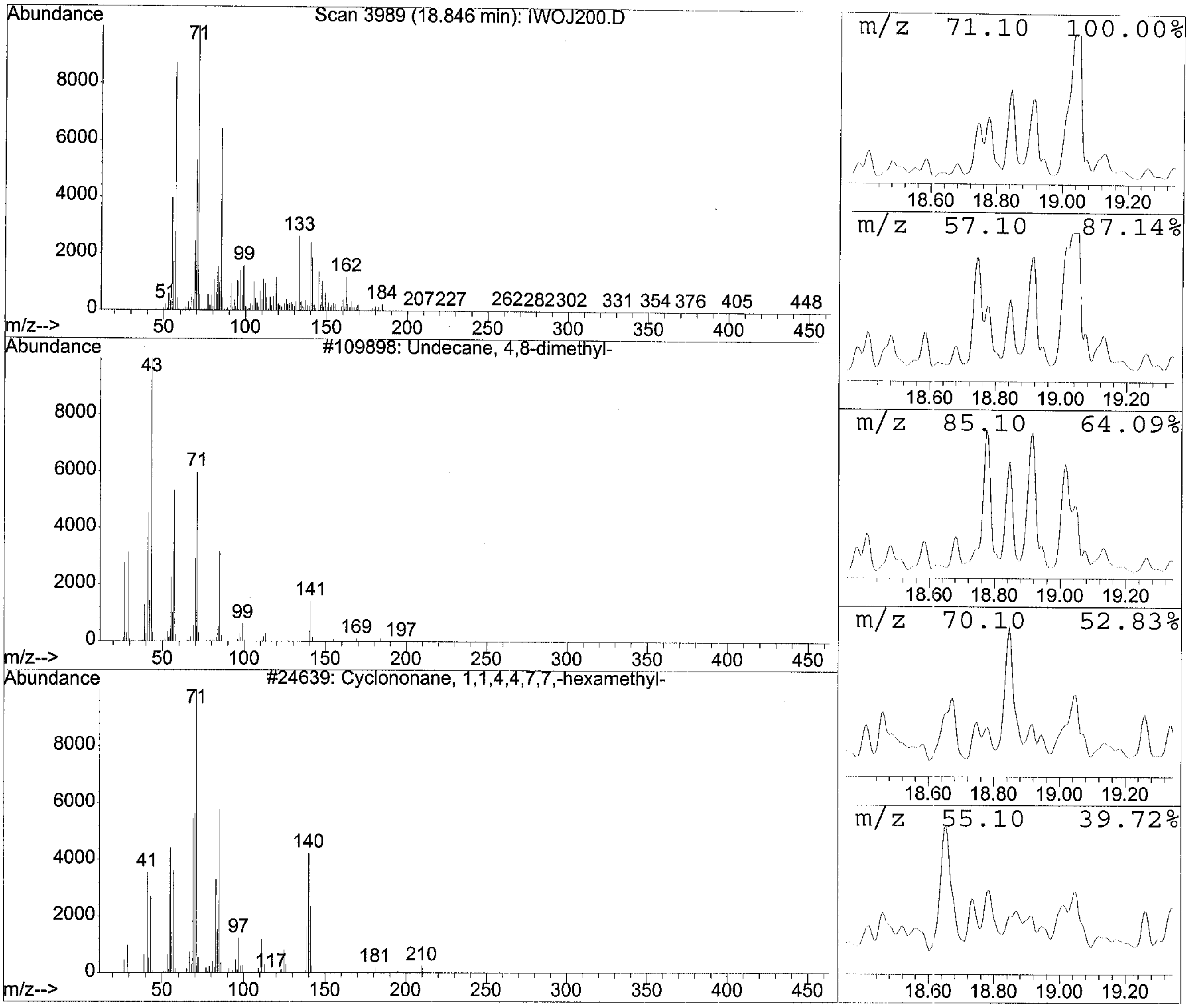


Peak Number: 70 at 18.65 min Area: 121295230 Area % 1.87

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, (4-methylpentyl)-	32981	061142-20-9	58
2 Cyclohexane, 1,1'-(1,4-butanediyl)b	116486	006165-44-2	58

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

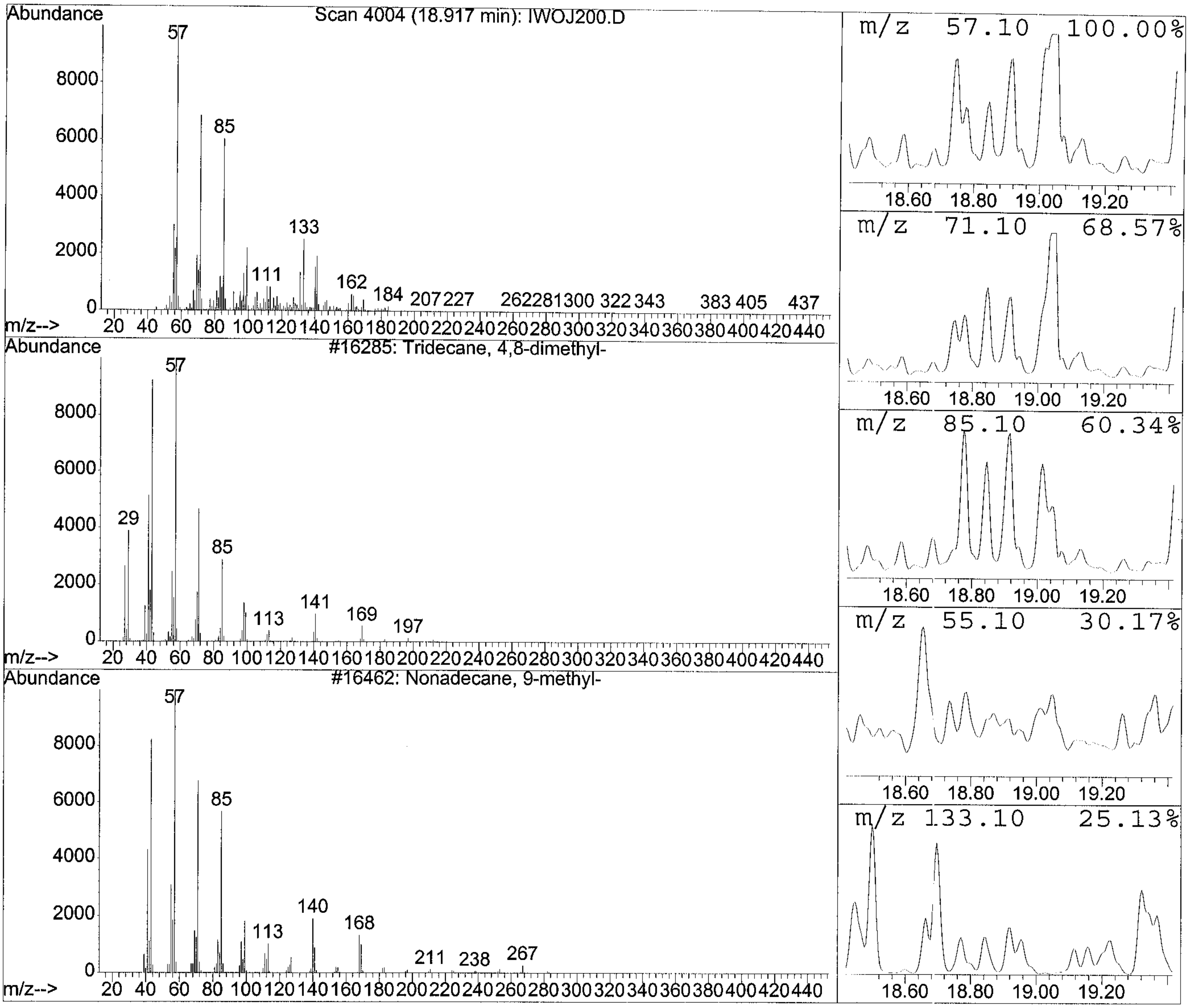


Peak Number: 71 at 18.85 min Area: 49083025 Area % 0.76

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Undecane, 4,8-dimethyl-	109898	017301-33-6	70
2 Cyclononane, 1,1,4,4,7,7,-hexamethy	24639	1000152-80-3	59

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

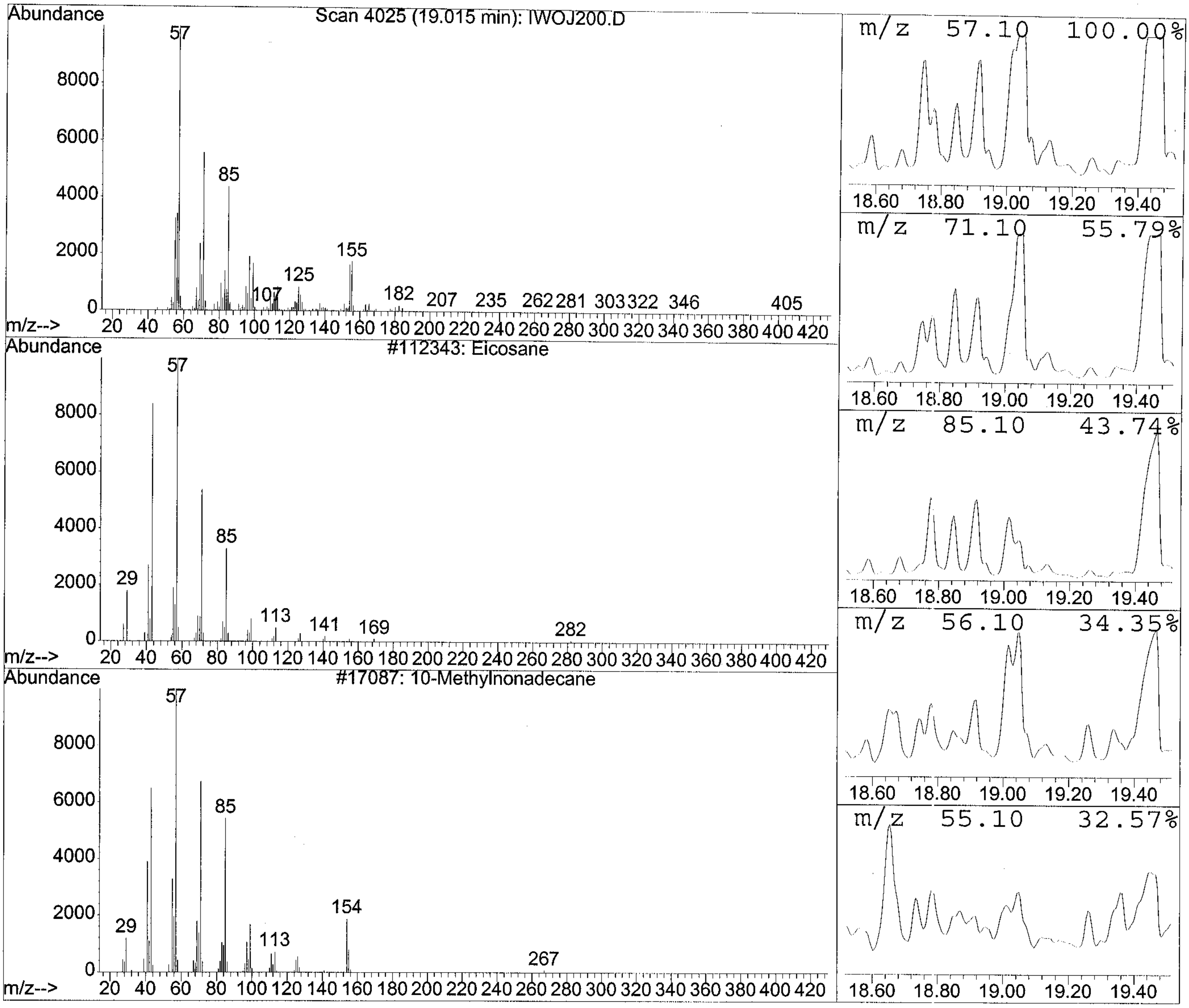


Peak Number: 72 at 18.92 min Area: 42324412 Area % 0.65

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Tridecane, 4,8-dimethyl-	16285	055030-62-1	76
2 Nonadecane, 9-methyl-	16462	013287-24-6	70

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

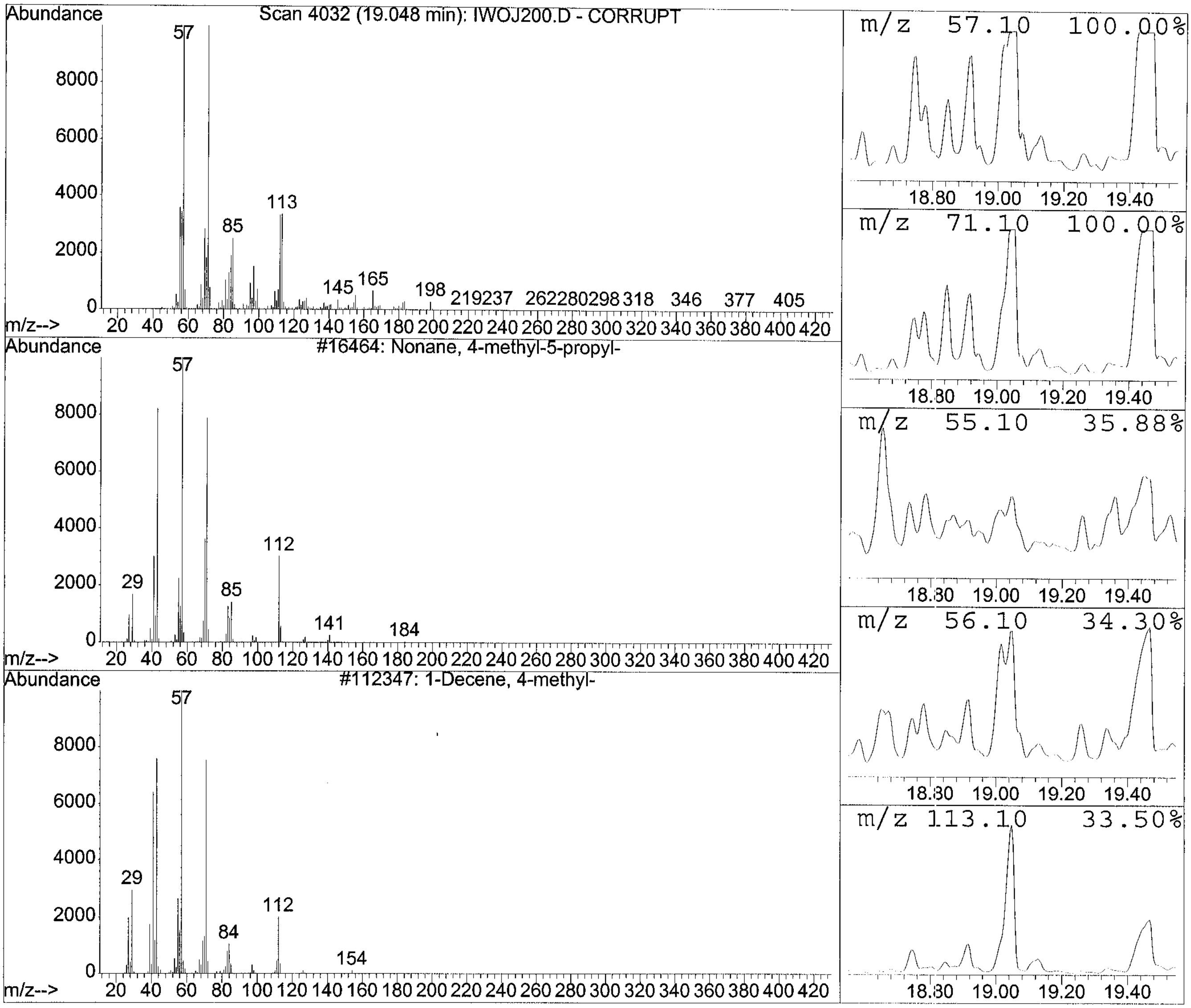


Peak Number: 73 at 19.02 min Area: 38078759 Area % 0.59

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Eicosane	112343	000112-95-8	90
2 10-Methylnonadecane	17087	056862-62-5	74

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

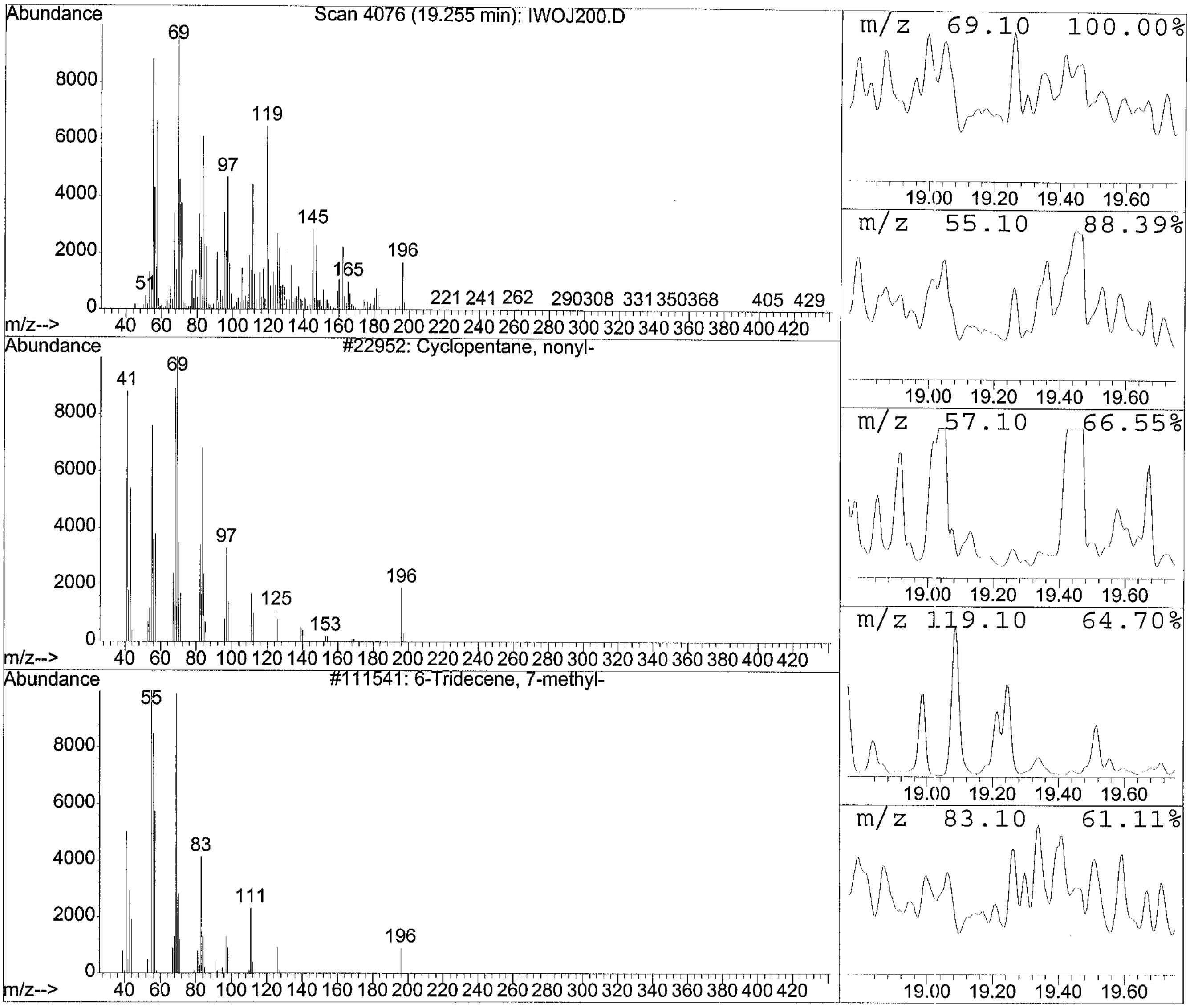


Peak Number: 74 at 19.05 min Area: 55531326 Area % 0.86

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Nonane, 4-methyl-5-propyl-	16464	062185-55-1	52
2 1-Decene, 4-methyl-	112347	013151-29-6	52

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

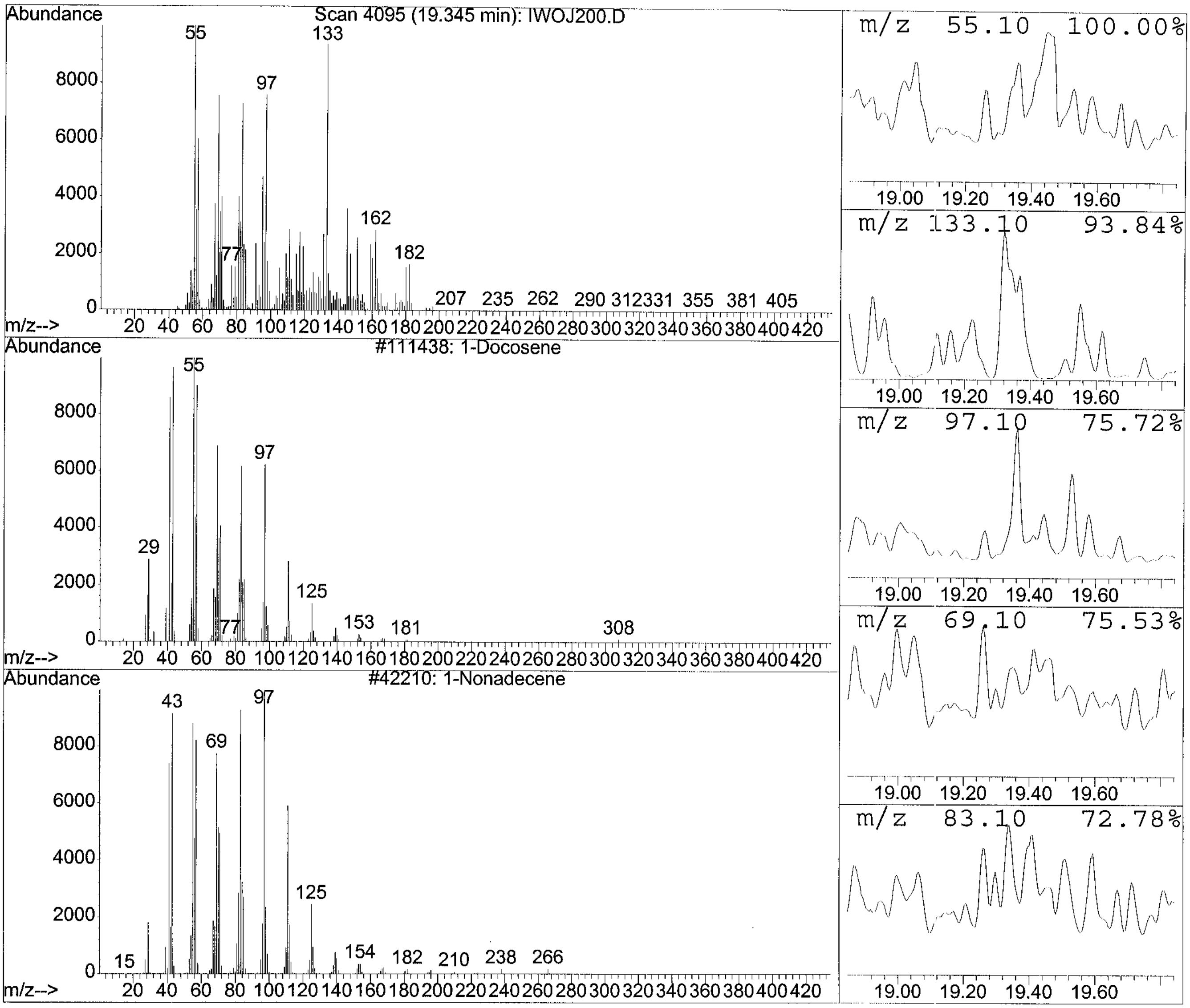


Peak Number: 75 at 19.26 min Area: 32170944 Area % 0.50

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclopentane, nonyl-	22952	002882-98-6	55
2 6-Tridecene, 7-methyl-	111541	024949-42-6	50

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

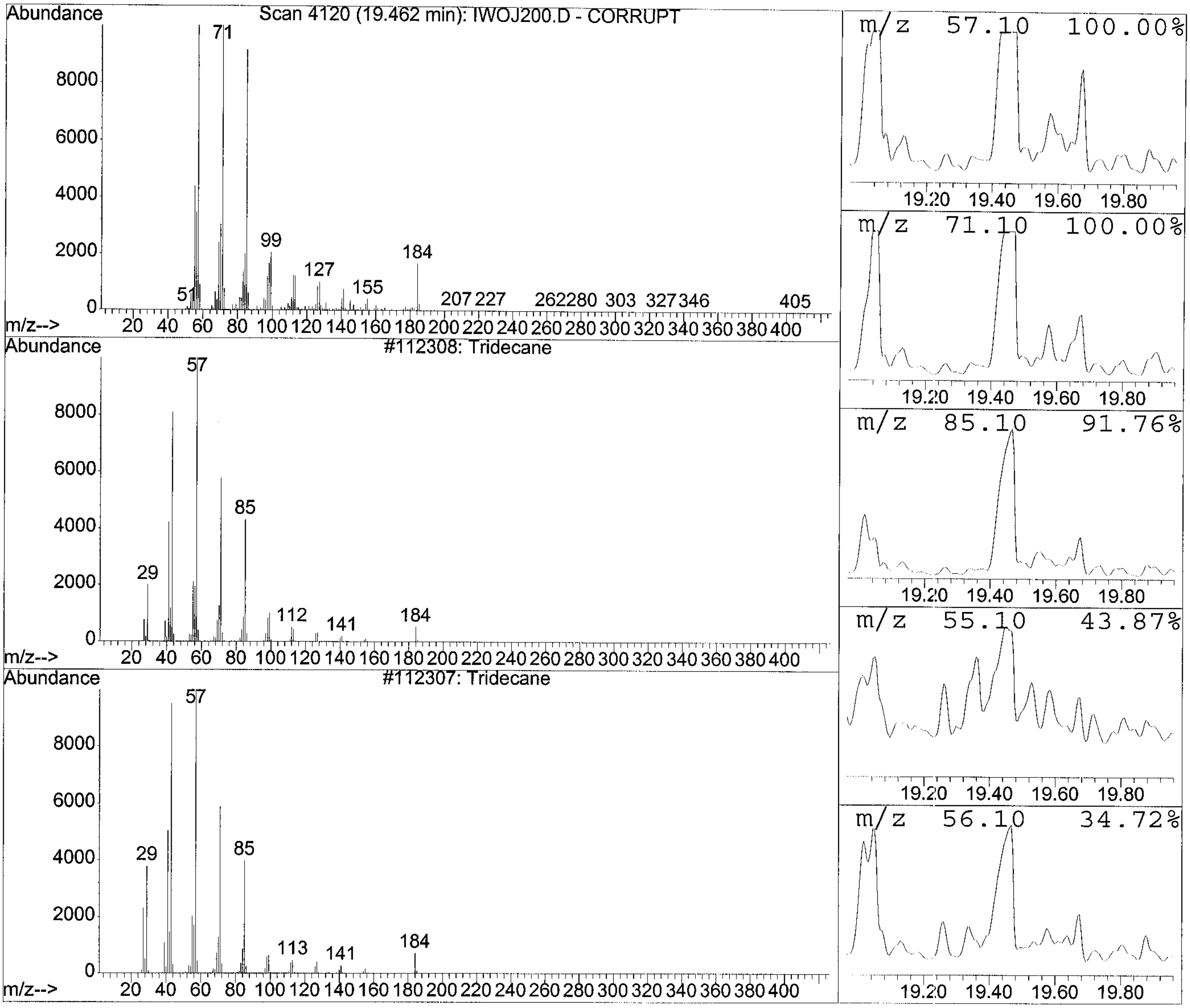


Peak Number: 76 at 19.34 min Area: 40845496 Area % 0.63

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Docosene	111438	001599-67-3	90
2 1-Nonadecene	42210	018435-45-5	42

Library Search Report - RTE Integrator

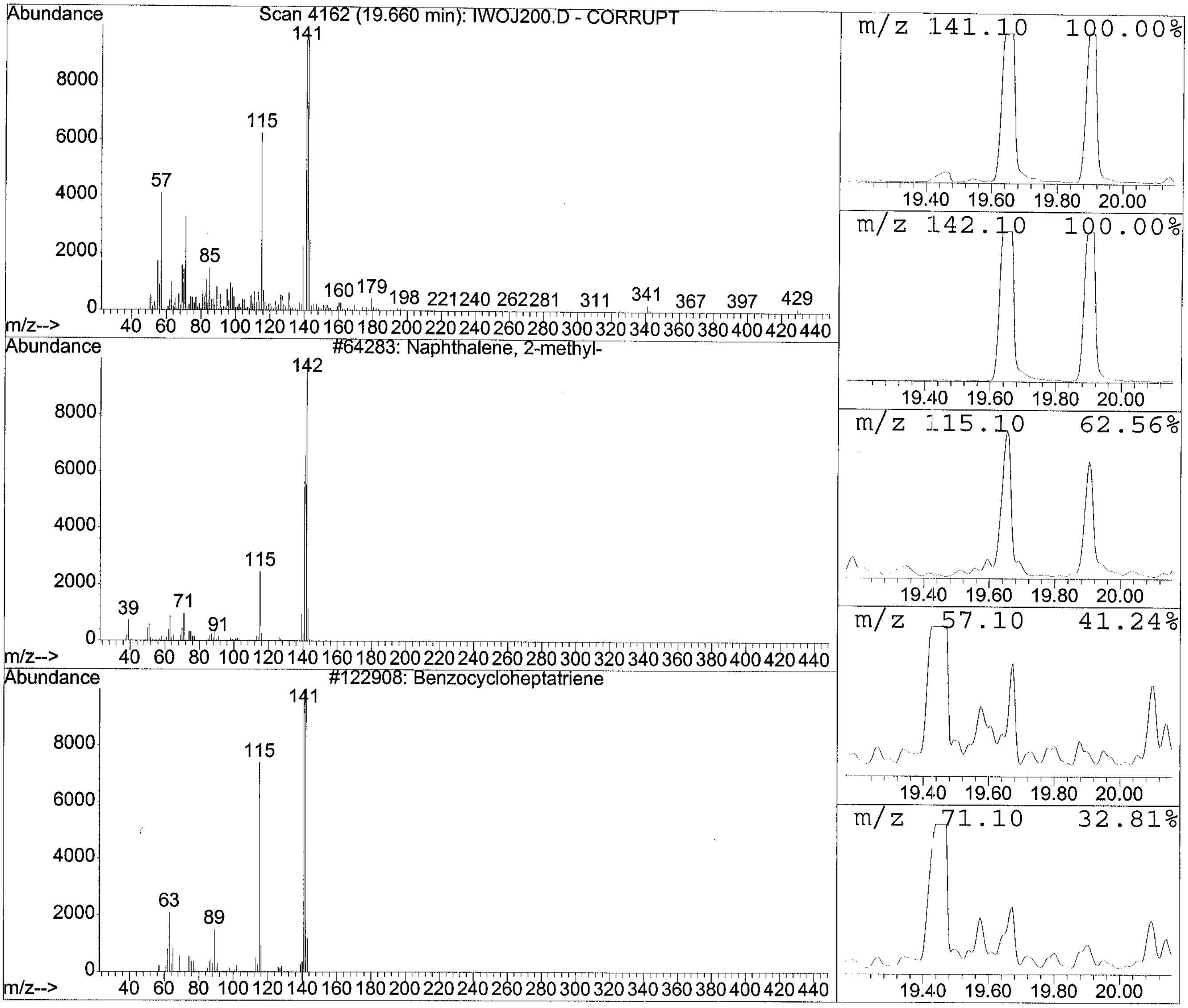
Unknown Spectrum based on Apex



Peak Number: 77 at 19.46 min Area: 143965518 Area % 2.22

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Tridecane	112308	000629-50-5	96
2 Tridecane	112307	000629-50-5	90

Unknown Spectrum based on Apex

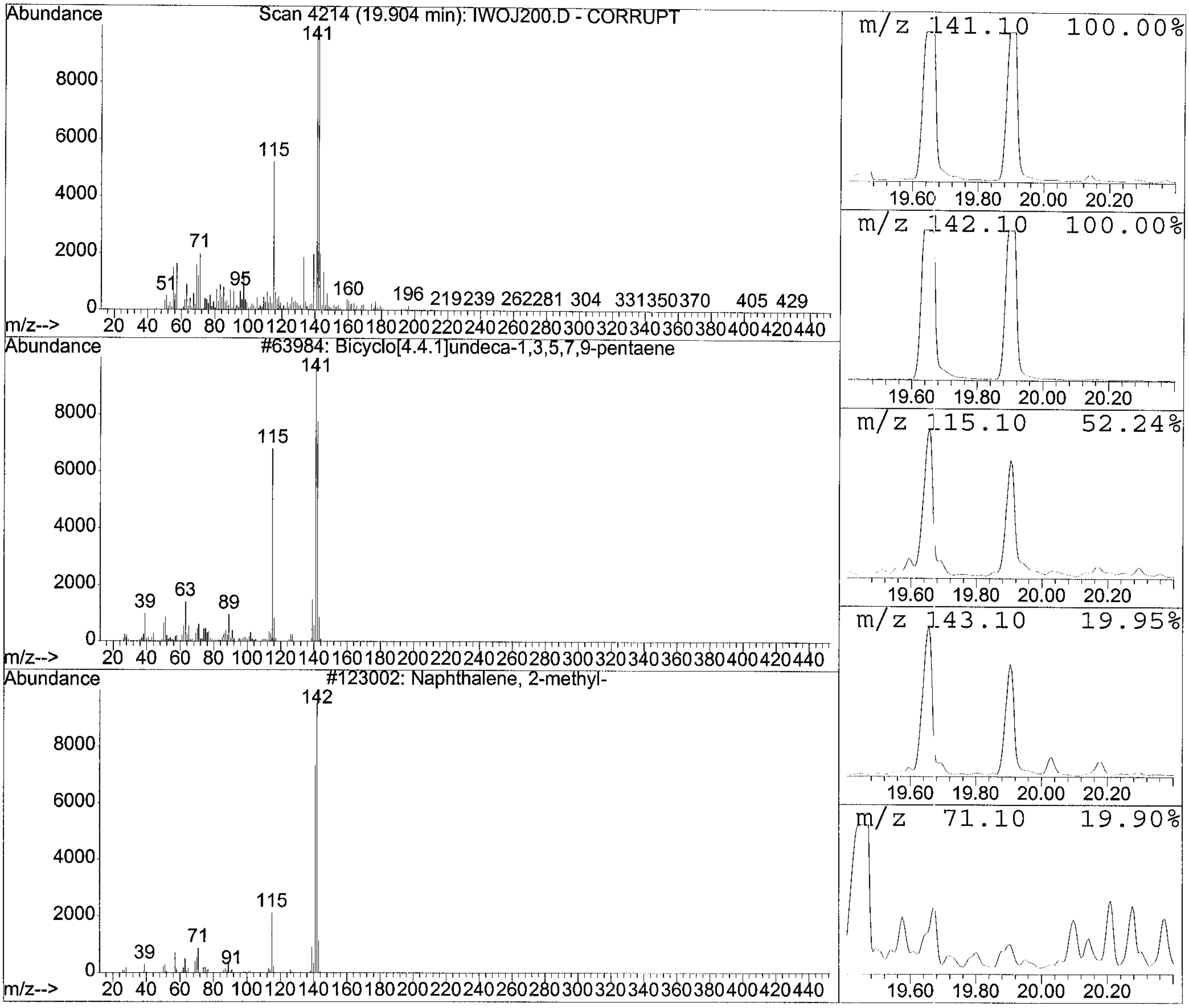


Peak Number: 78 at 19.66 min Area: 107783741 Area % 1.66

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 2-methyl-	64283	000091-57-6	80
2 Benzocycloheptatriene	122908	000264-09-5	76

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

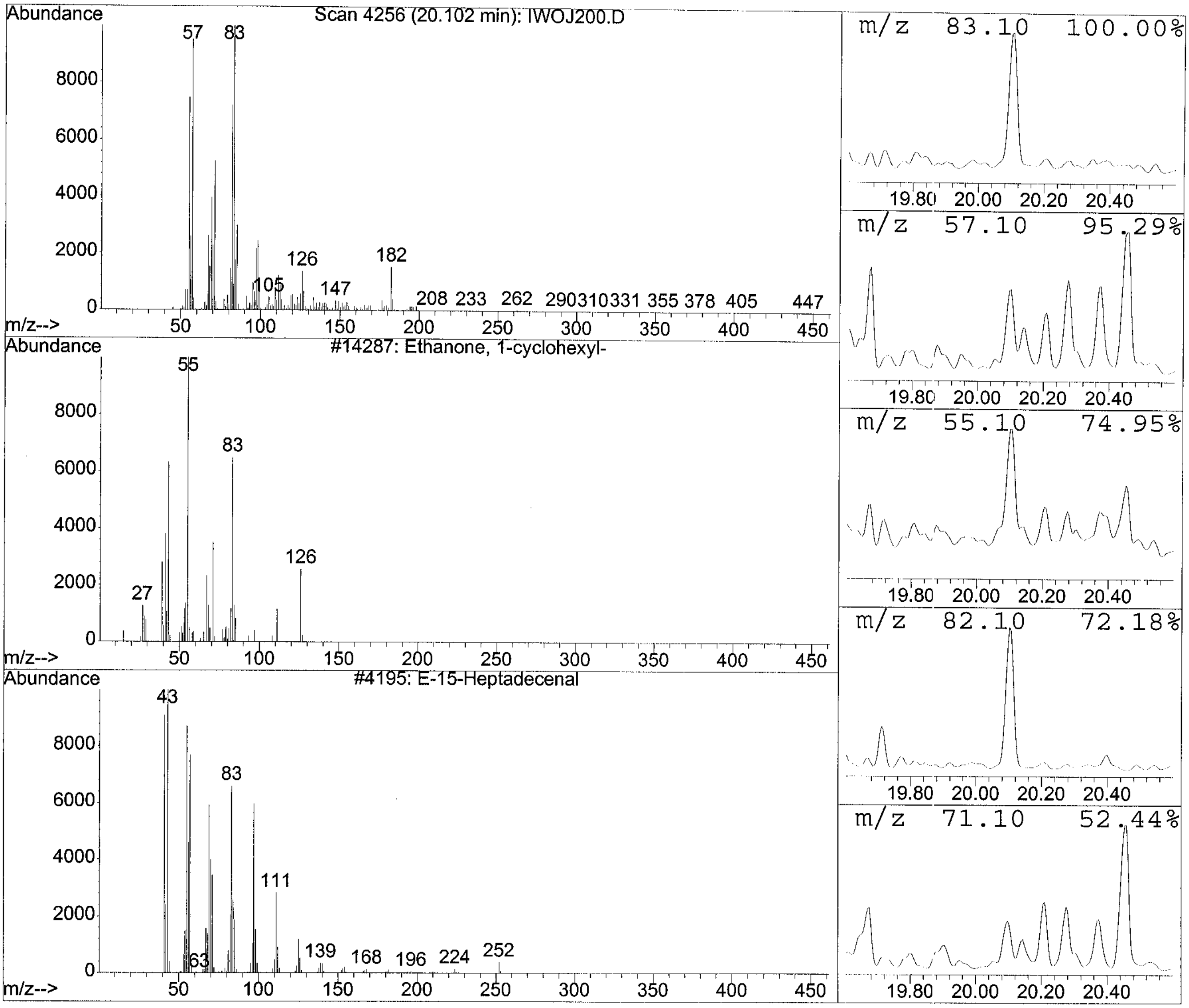


Peak Number: 79 at 19.90 min Area: 69126987 Area % 1.07

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Bicyclo[4.4.1]undeca-1,3,5,7,9-pent	63984	002443-46-1	76
2 Naphthalene, 2-methyl-	123002	000091-57-6	74

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

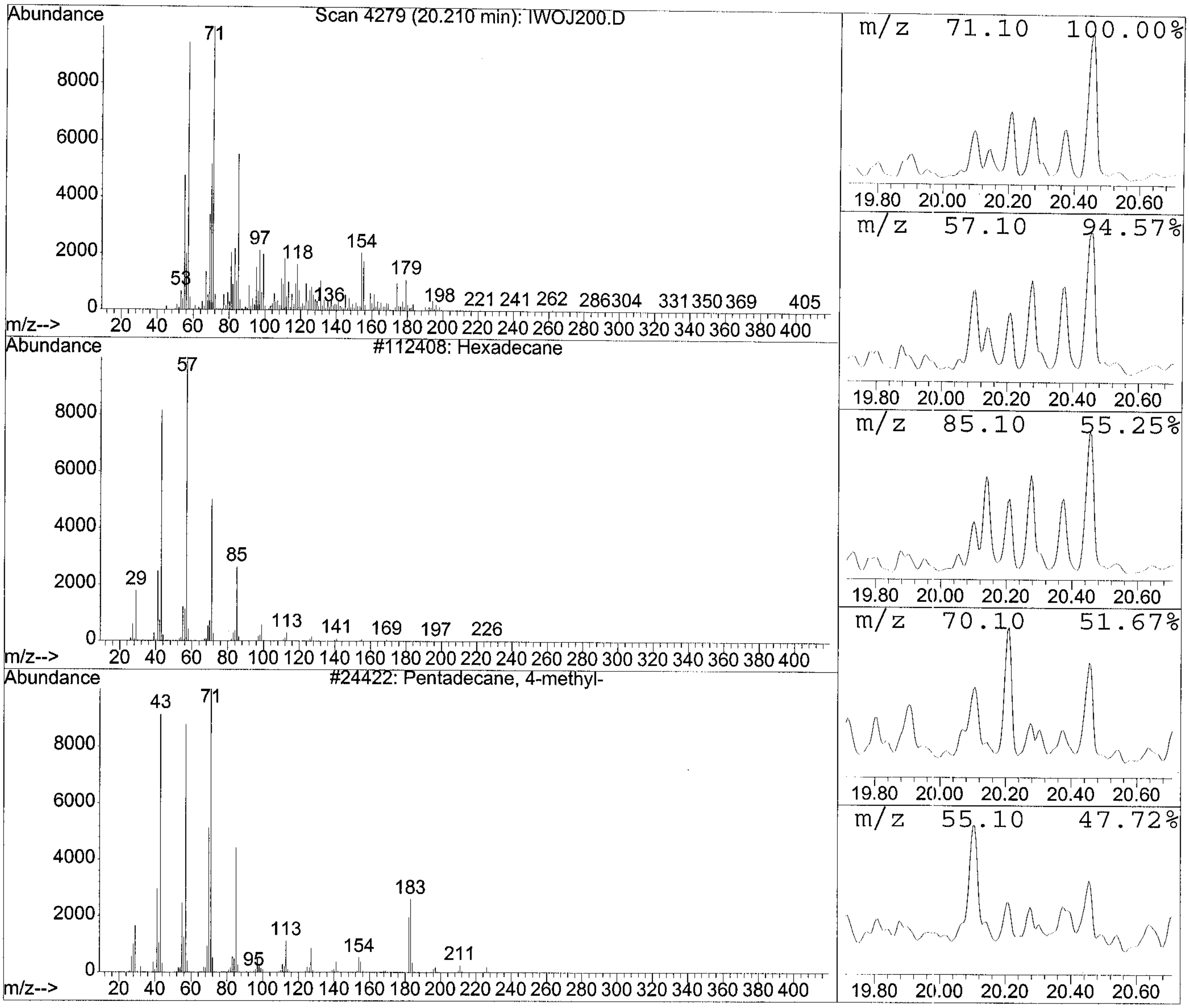


Peak Number: 80 at 20.10 min Area: 42536058 Area % 0.66

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Ethanone, 1-cyclohexyl-	14287	000823-76-7	60
2 E-15-Heptadecenal	4195	1000130-97-9	58

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

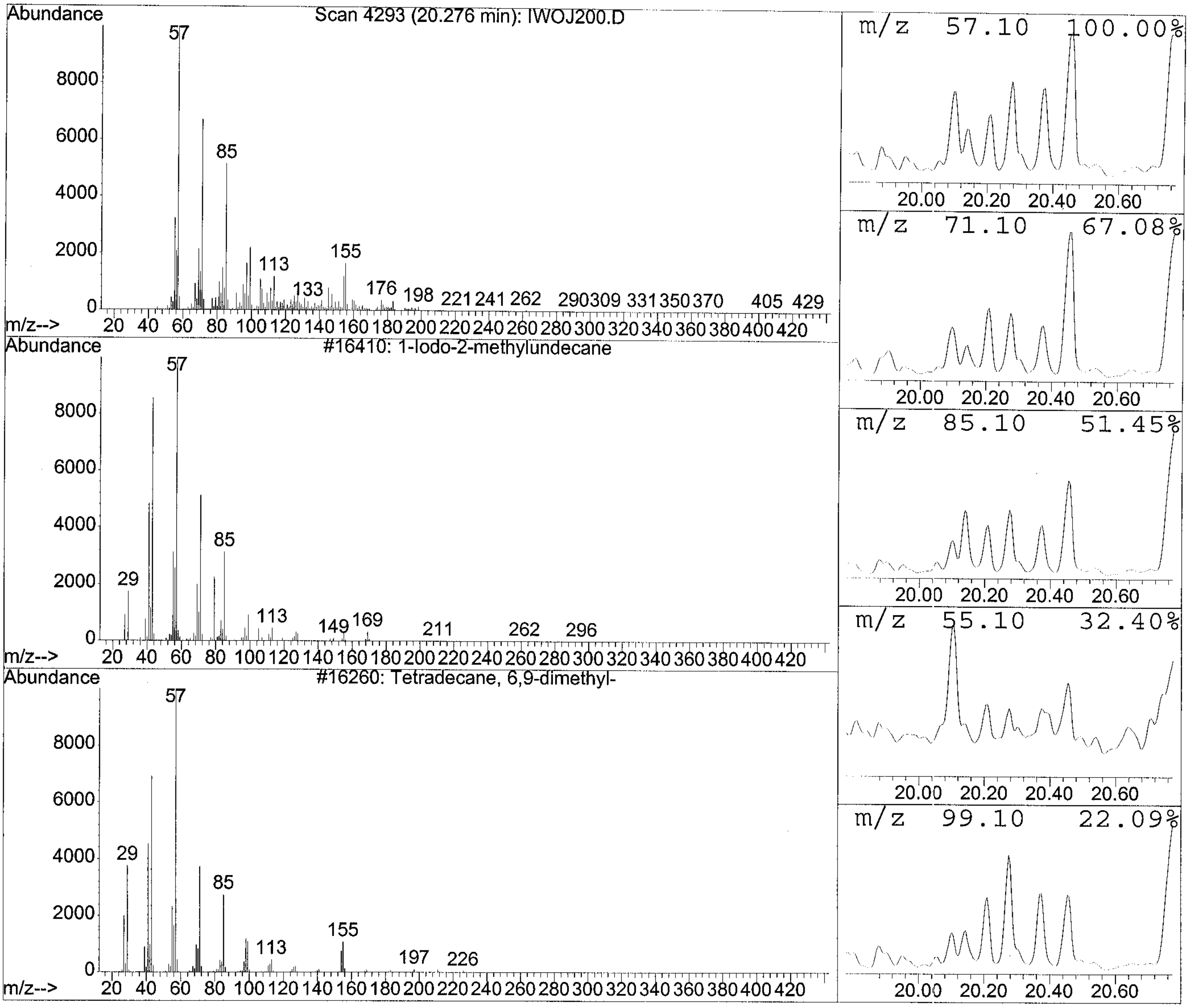


Peak Number: 81 at 20.21 min Area: 28678554 Area % 0.44

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Hexadecane	112408	000544-76-3	60
2 Pentadecane, 4-methyl-	24422	002801-87-8	58

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

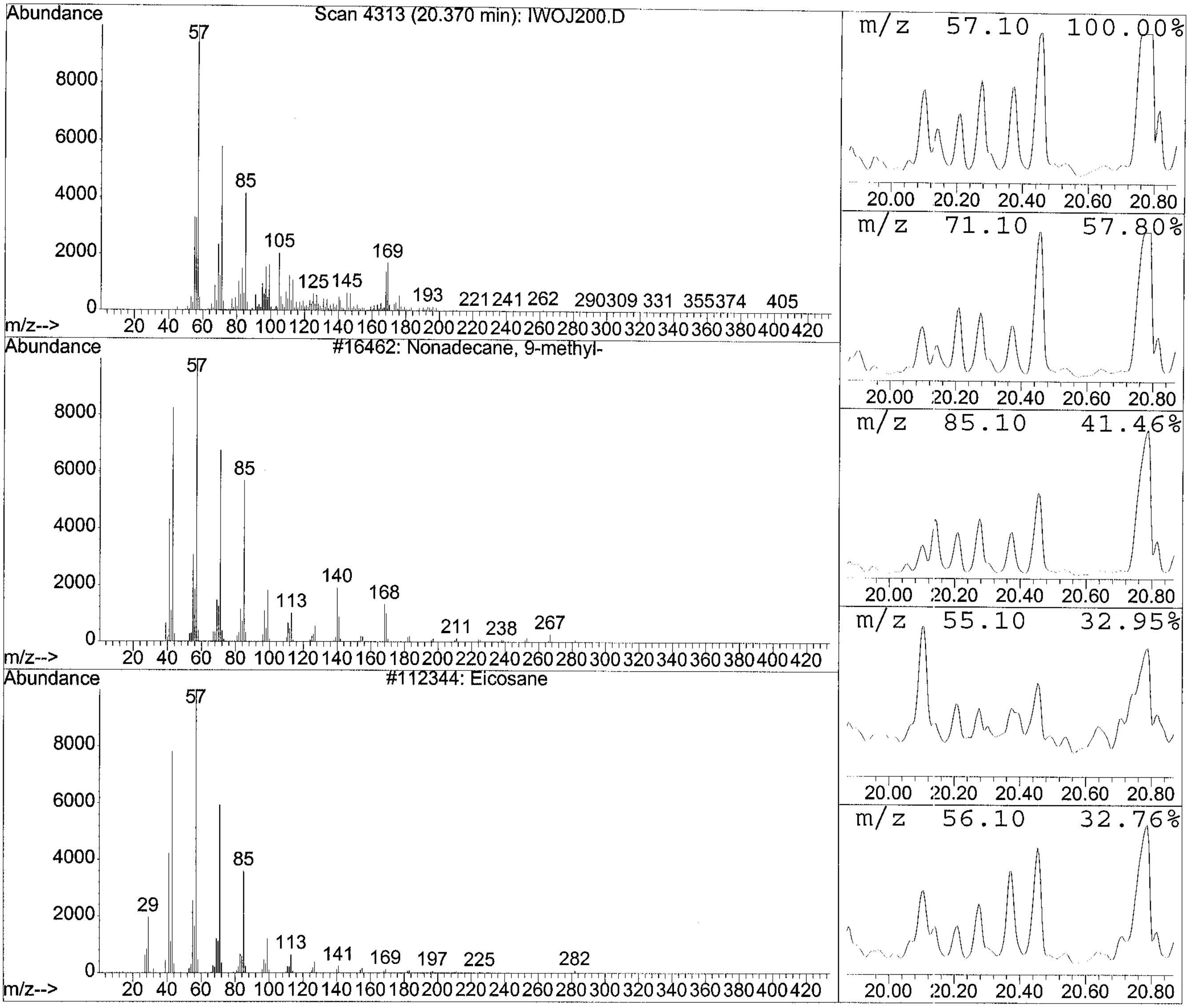


Peak Number: 82 at 20.28 min Area: 47164180 Area % 0.73

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1-Iodo-2-methylundecane	16410	073105-67-6	93
2 Tetradecane, 6,9-dimethyl-	16260	055045-13-1	91

Library Search Report - RTE Integrator

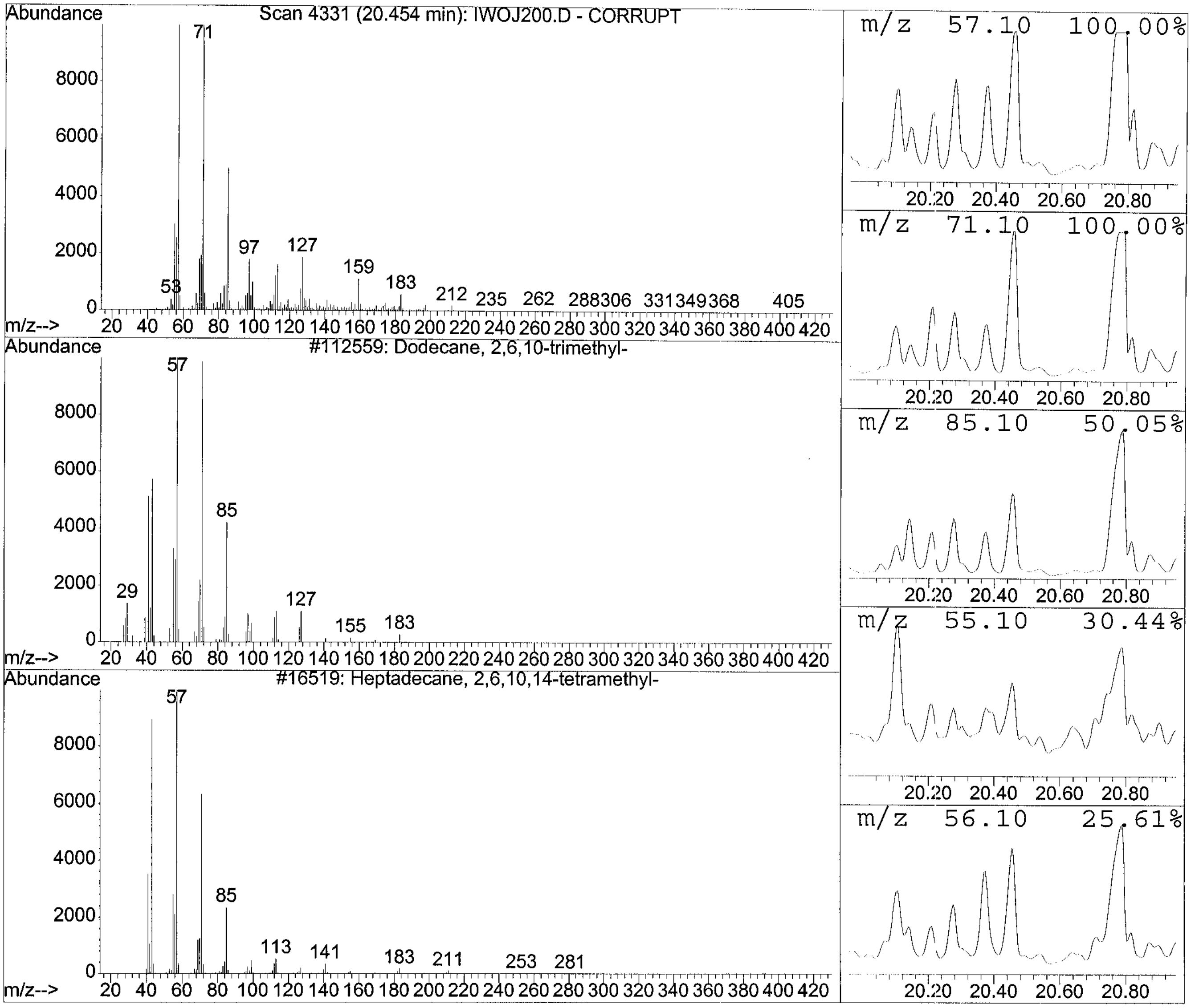
Unknown Spectrum based on Apex



Peak Number: 83 at 20.37 min Area: 32229818 Area % 0.50

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Nonadecane, 9-methyl-	16462	013287-24-6	68
2 Eicosane	112344	000112-95-8	60

Unknown Spectrum based on Apex

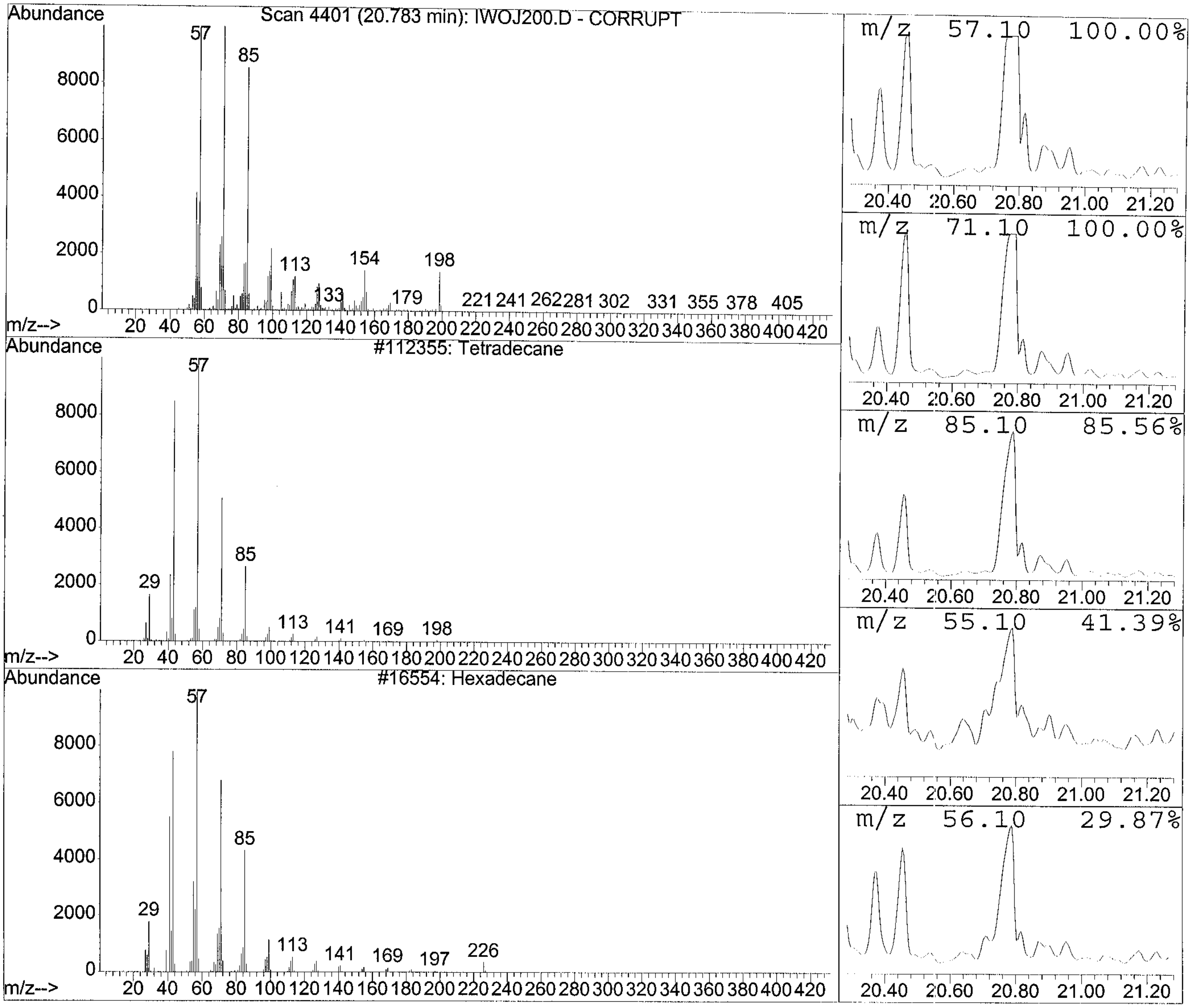


Peak Number: 84 at 20.45 min Area: 65441116 Area % 1.01

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Dodecane, 2,6,10-trimethyl-	112559	003891-98-3	91
2 Heptadecane, 2,6,10,14-tetramethyl-	16519	018344-37-1	90

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

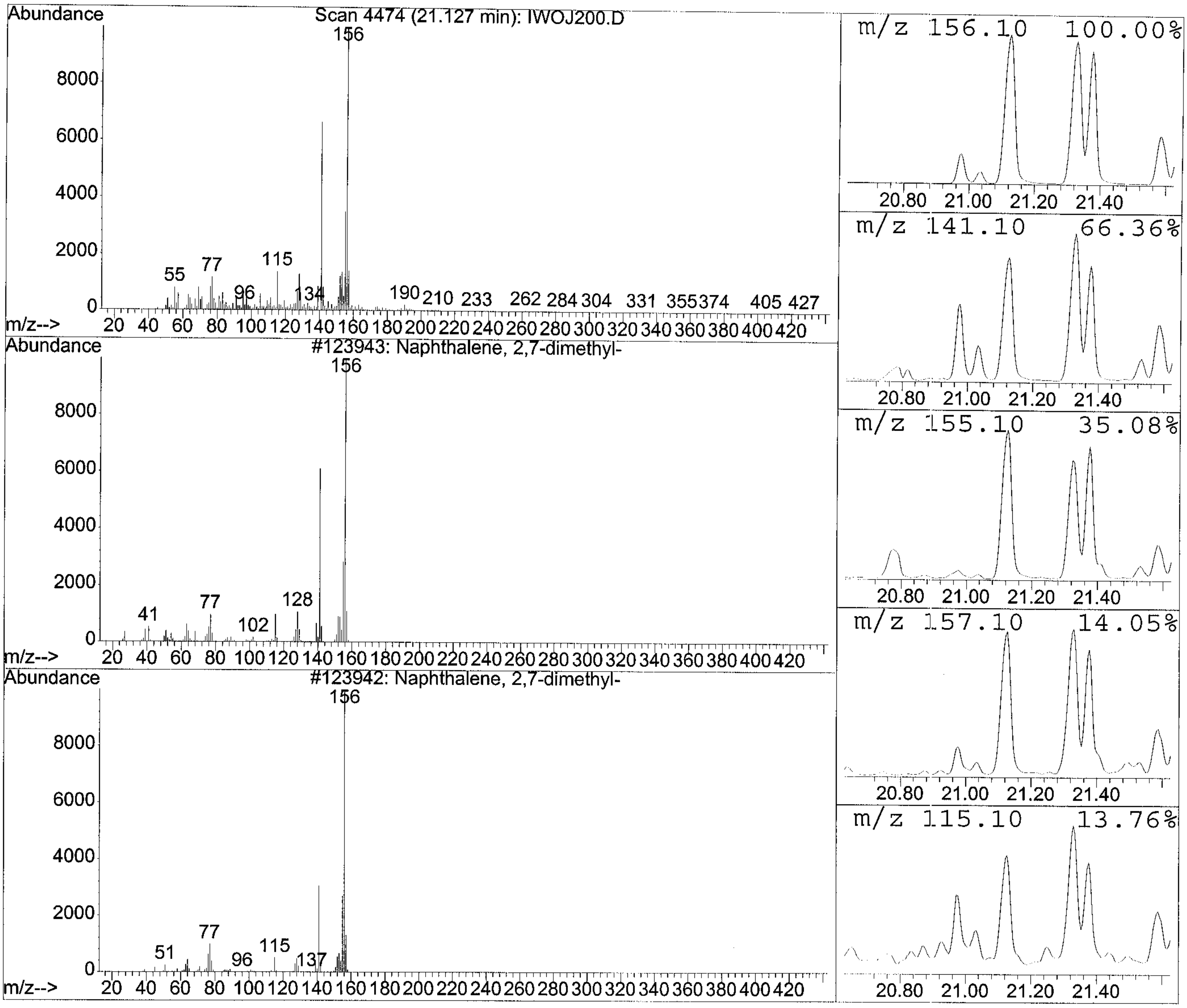


Peak Number: 85 at 20.78 min Area: 119797821 Area % 1.85

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Tetradecane	112355	000629-59-4	95
2 Hexadecane	16554	000544-76-3	95

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

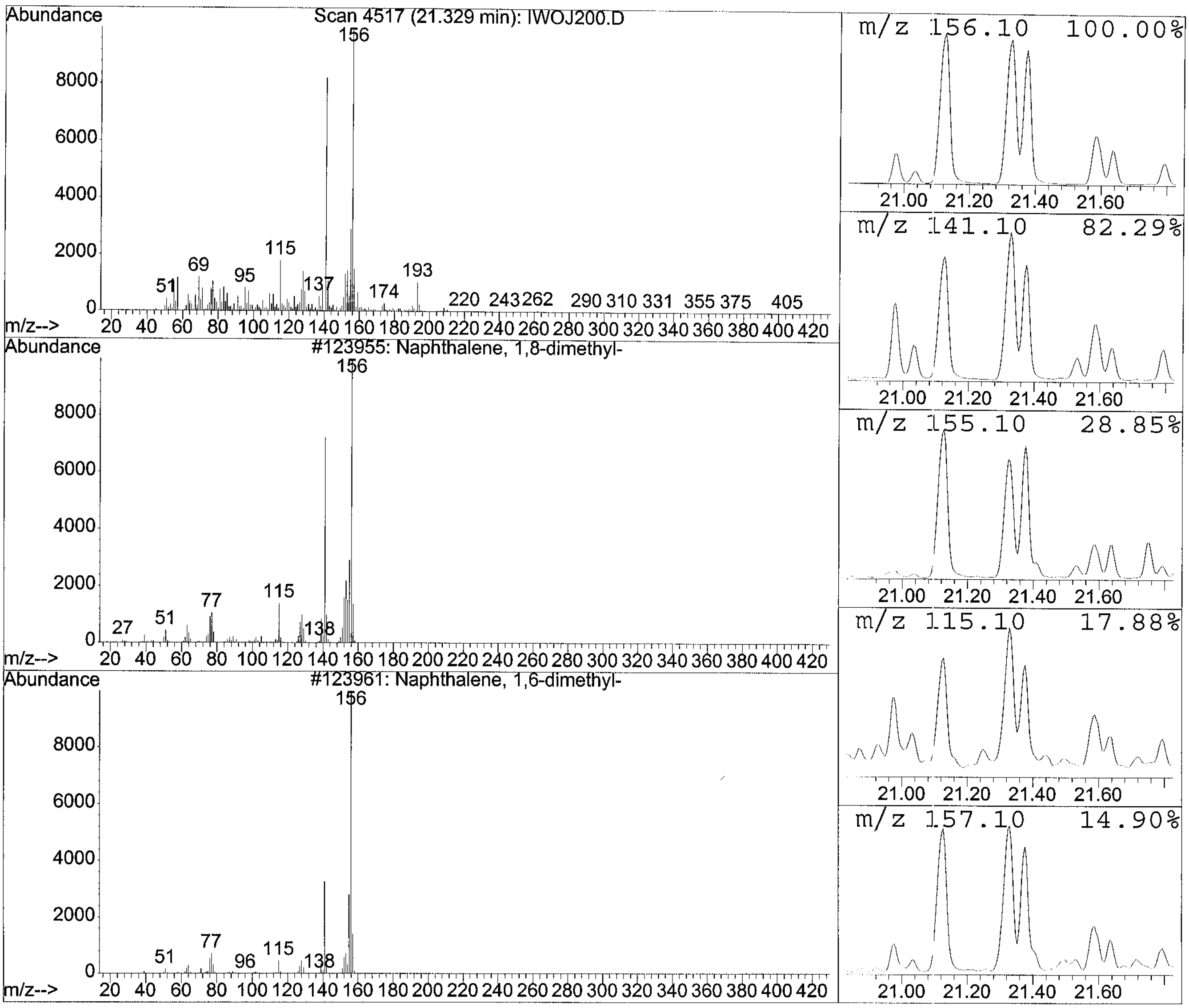


Peak Number: 86 at 21.13 min Area: 69460332 Area % 1.07

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 2,7-dimethyl-	123943	000582-16-1	98
2 Naphthalene, 2,7-dimethyl-	123942	000582-16-1	97

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

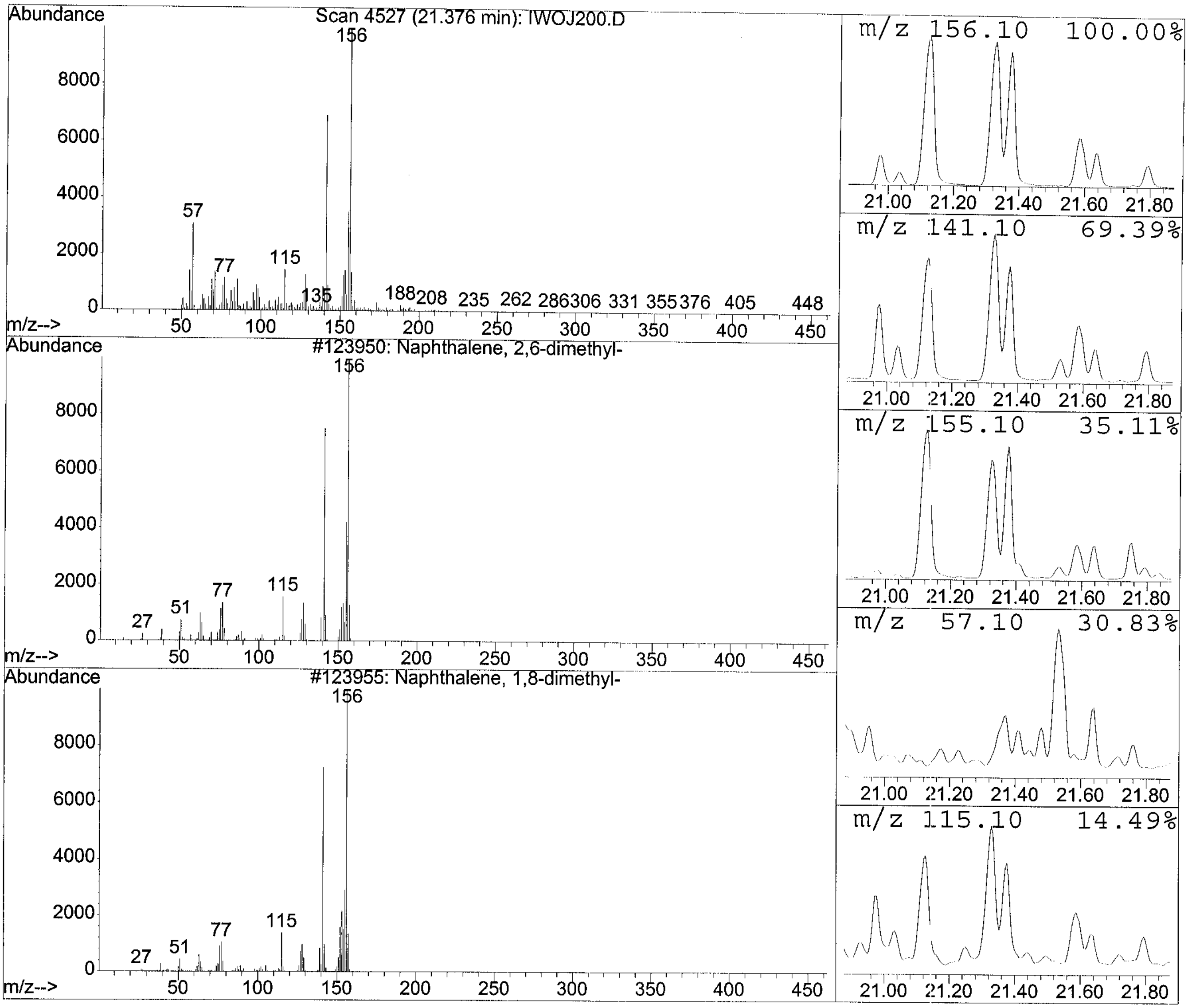


Peak Number: 87 at 21.33 min Area: 54916554 Area % 0.85

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 1,8-dimethyl-	123955	000569-41-5	97
2 Naphthalene, 1,6-dimethyl-	123961	000575-43-9	97

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

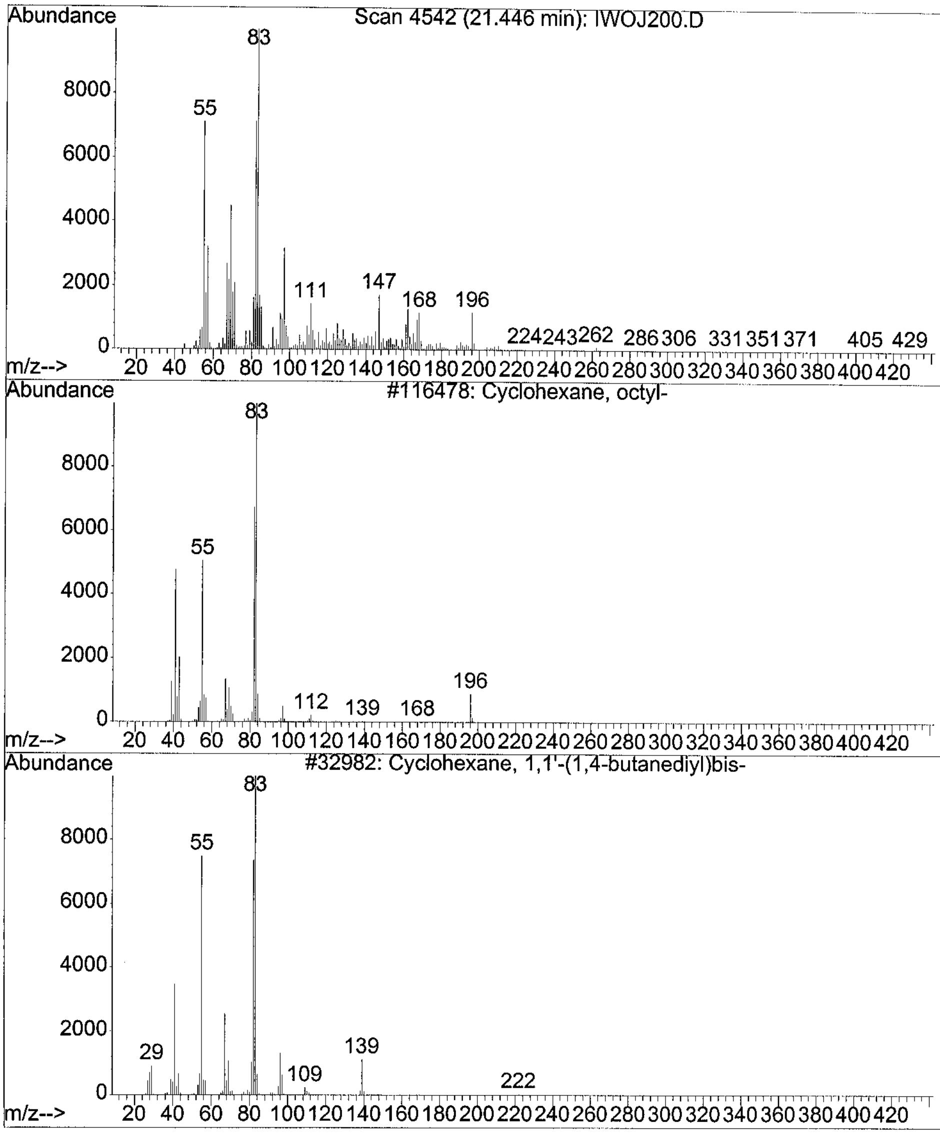


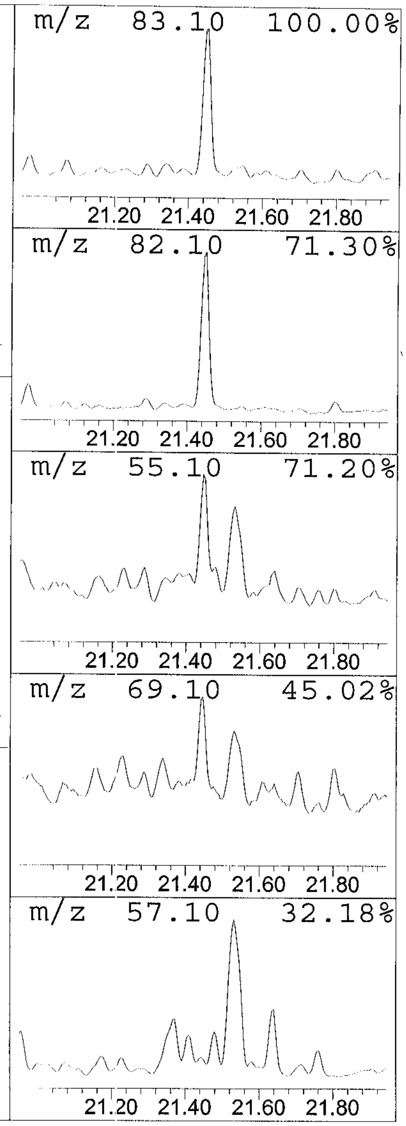
Peak Number: 88 at 21.38 min Area: 34310268 Area % 0.53

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 2,6-dimethyl-	123950	000581-42-0	98
2 Naphthalene, 1,8-dimethyl-	123955	000569-41-5	97

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



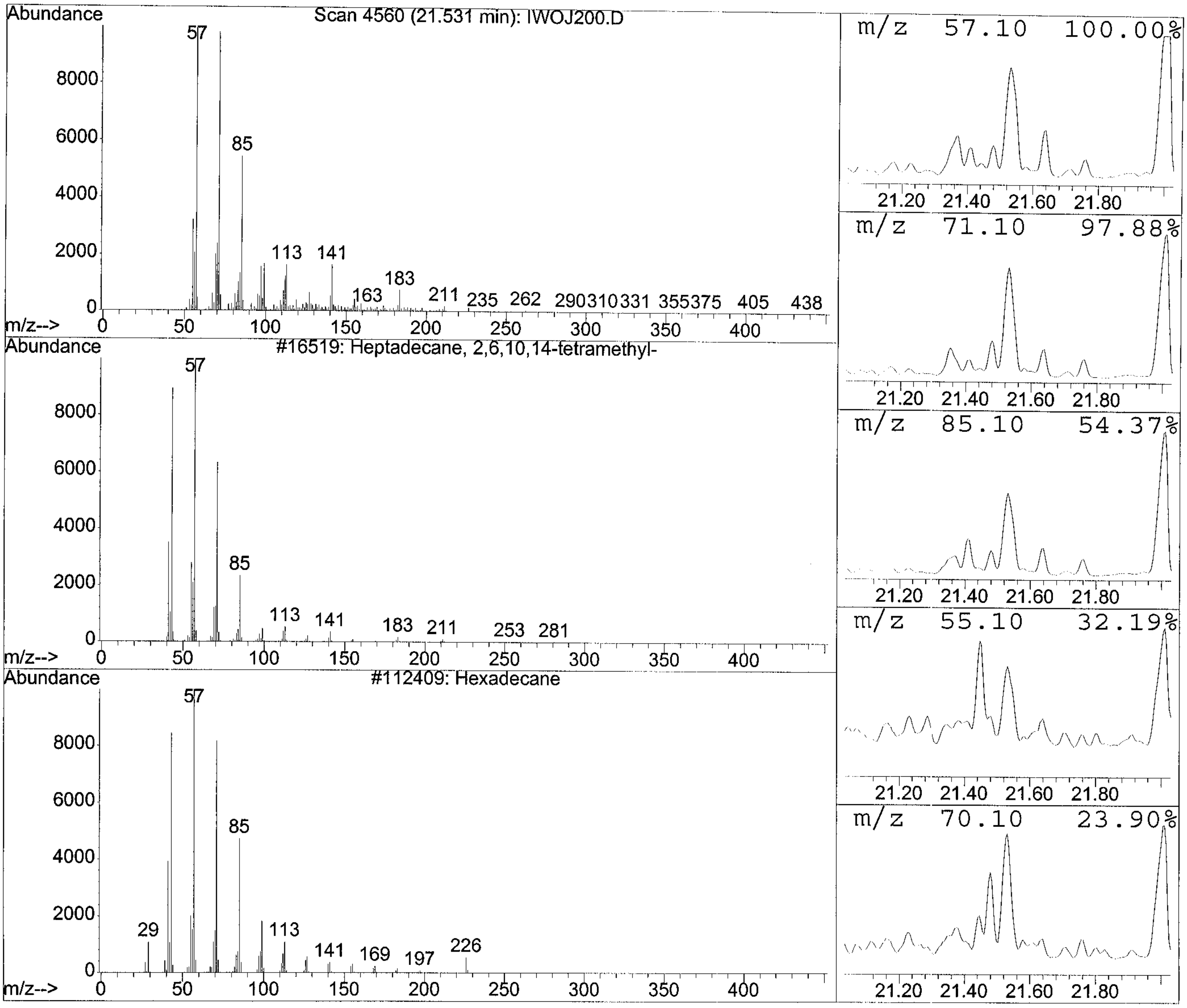


Peak Number: 89 at 21.45 min Area: 15626791 Area % 0.24

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Cyclohexane, octyl-	116478	001795-15-9	52
2 Cyclohexane, 1,1'-(1,4-butanediyl)b	32982	006165-44-2	52

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

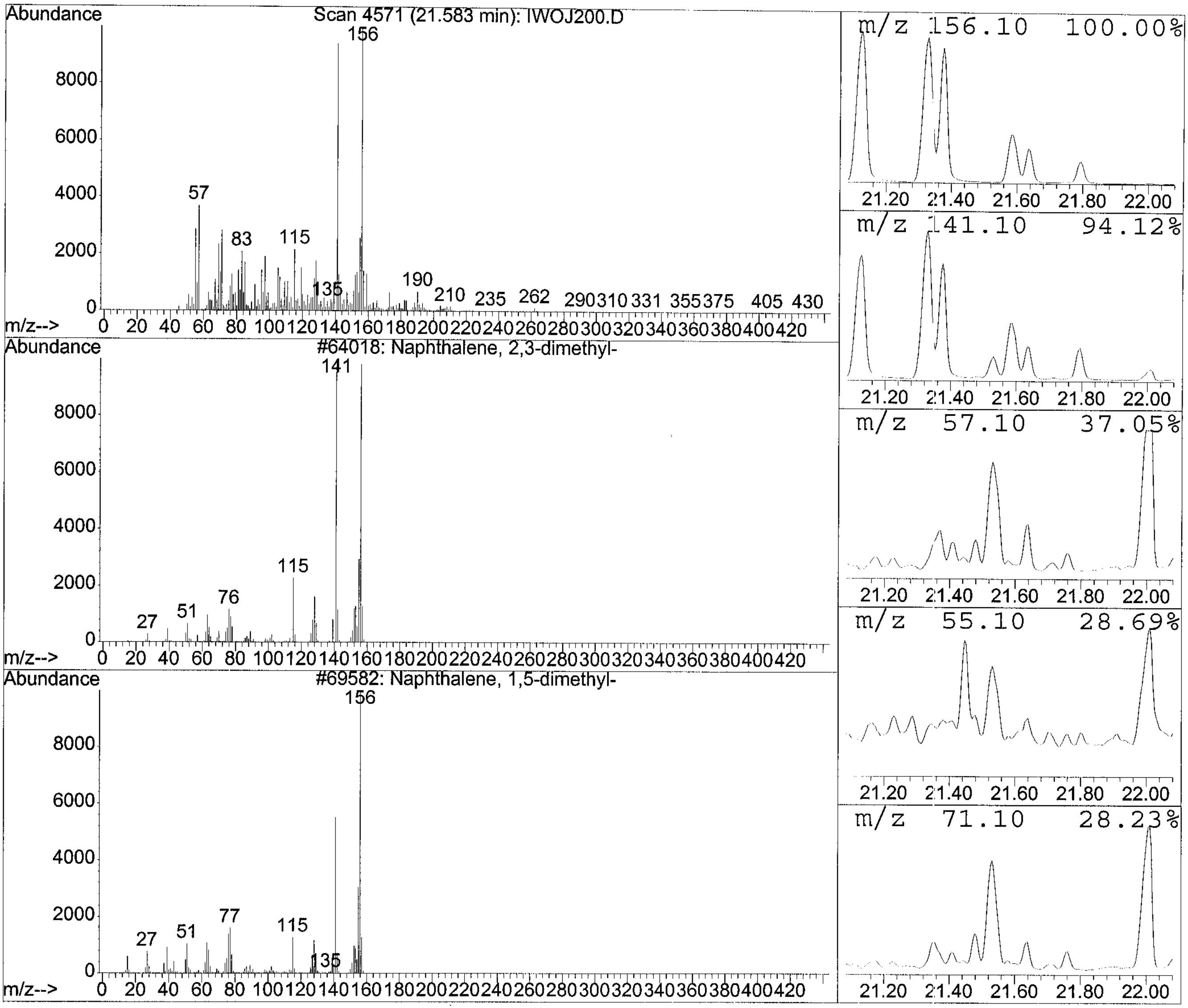


Peak Number: 90 at 21.53 min Area: 51779301 Area % 0.80

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Heptadecane, 2,6,10,14-tetramethyl-	16519	018344-37-1	96
2 Hexadecane	112409	000544-76-3	87

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

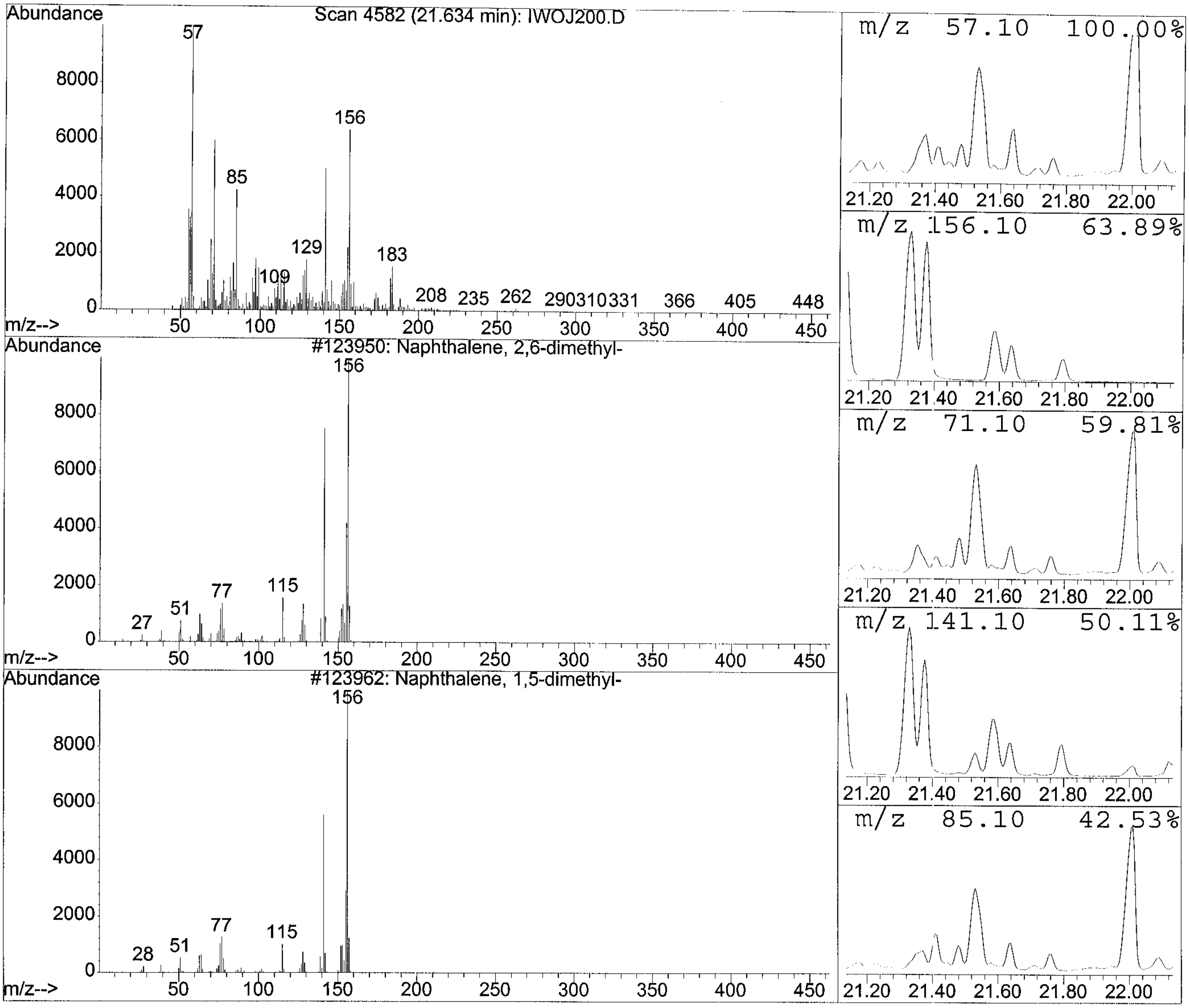


Peak Number: 91 at 21.58 min Area: 23679182 Area % 0.37

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 2,3-dimethyl-	64018	000581-40-8	98
2 Naphthalene, 1,5-dimethyl-	69582	000571-61-9	96

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

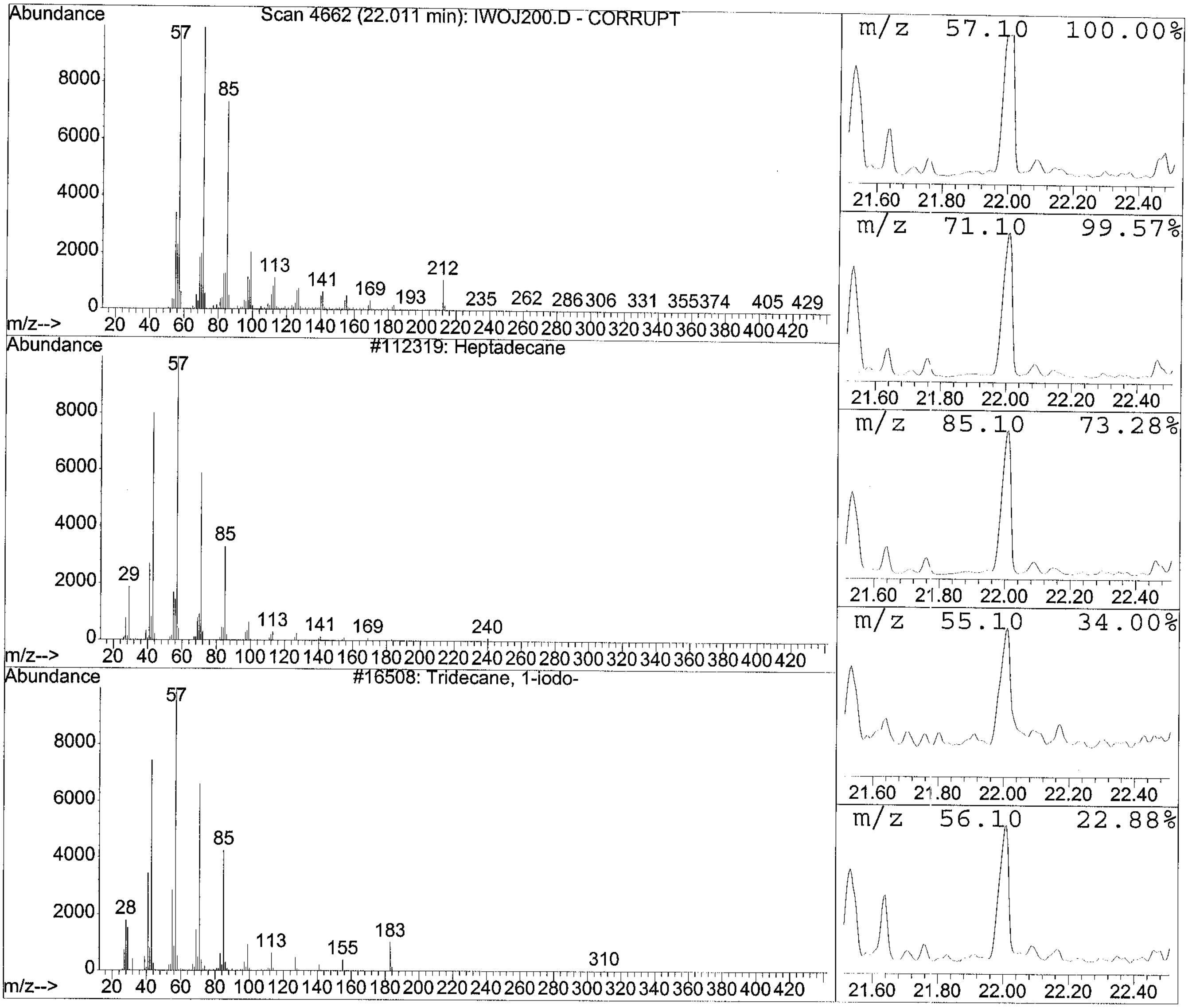


Peak Number: 92 at 21.63 min Area: 25724489 Area % 0.40

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 2,6-dimethyl-	123950	000581-42-0	89
2 Naphthalene, 1,5-dimethyl-	123962	000571-61-9	87

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

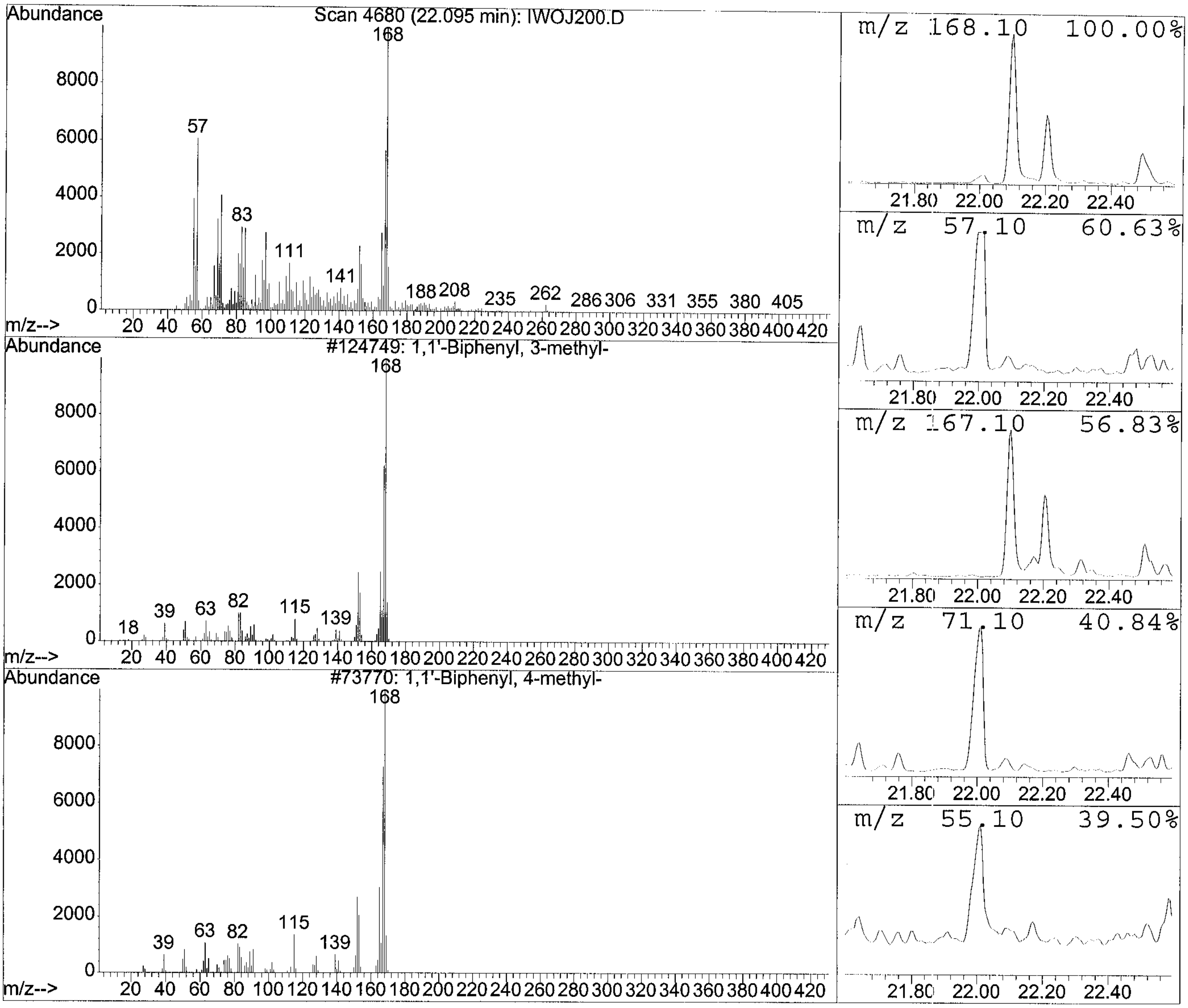


Peak Number: 93 at 22.01 min Area: 84974933 Area % 1.31

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Heptadecane	112319	000629-78-7	97
2 Tridecane, 1-iodo-	16508	035599-77-0	95

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

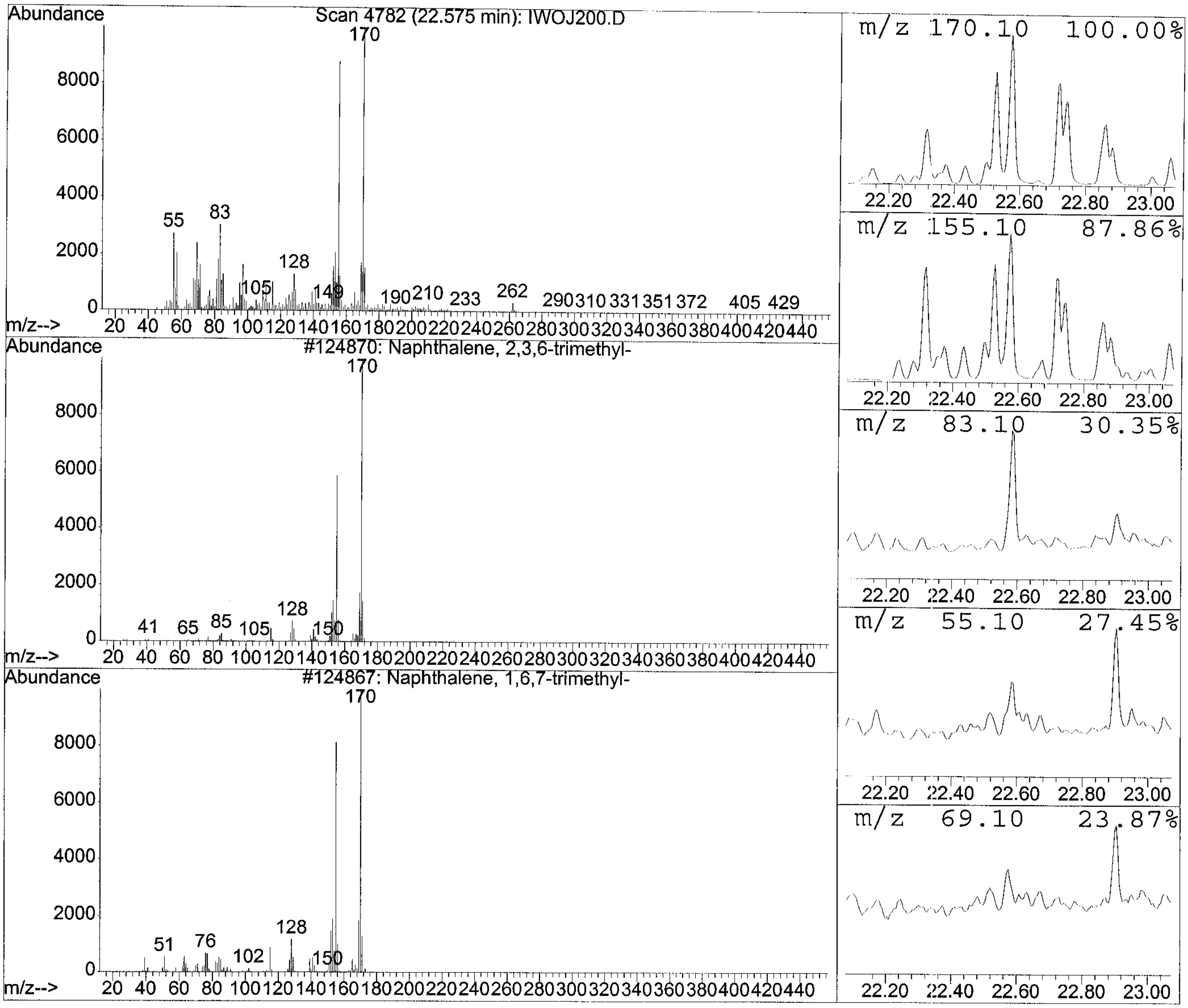


Peak Number: 94 at 22.10 min Area: 14427340 Area % 0.22

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 1,1'-Biphenyl, 3-methyl-	124749	000643-93-6	78
2 1,1'-Biphenyl, 4-methyl-	73770	000644-08-6	78

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

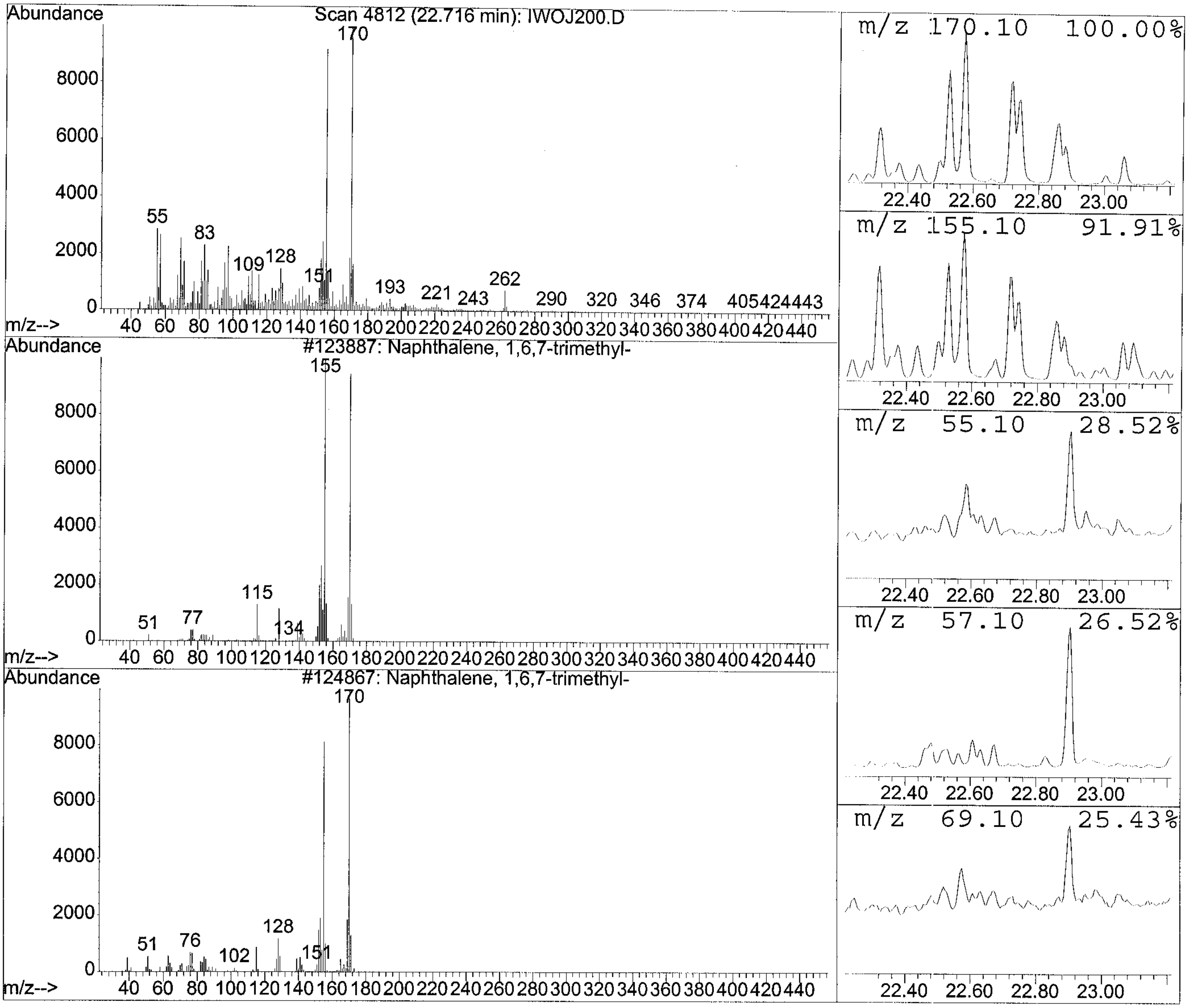


Peak Number: 95 at 22.57 min Area: 23429910 Area % 0.36

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 2,3,6-trimethyl-	124870	000829-26-5	97
2 Naphthalene, 1,6,7-trimethyl-	124867	002245-38-7	97

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

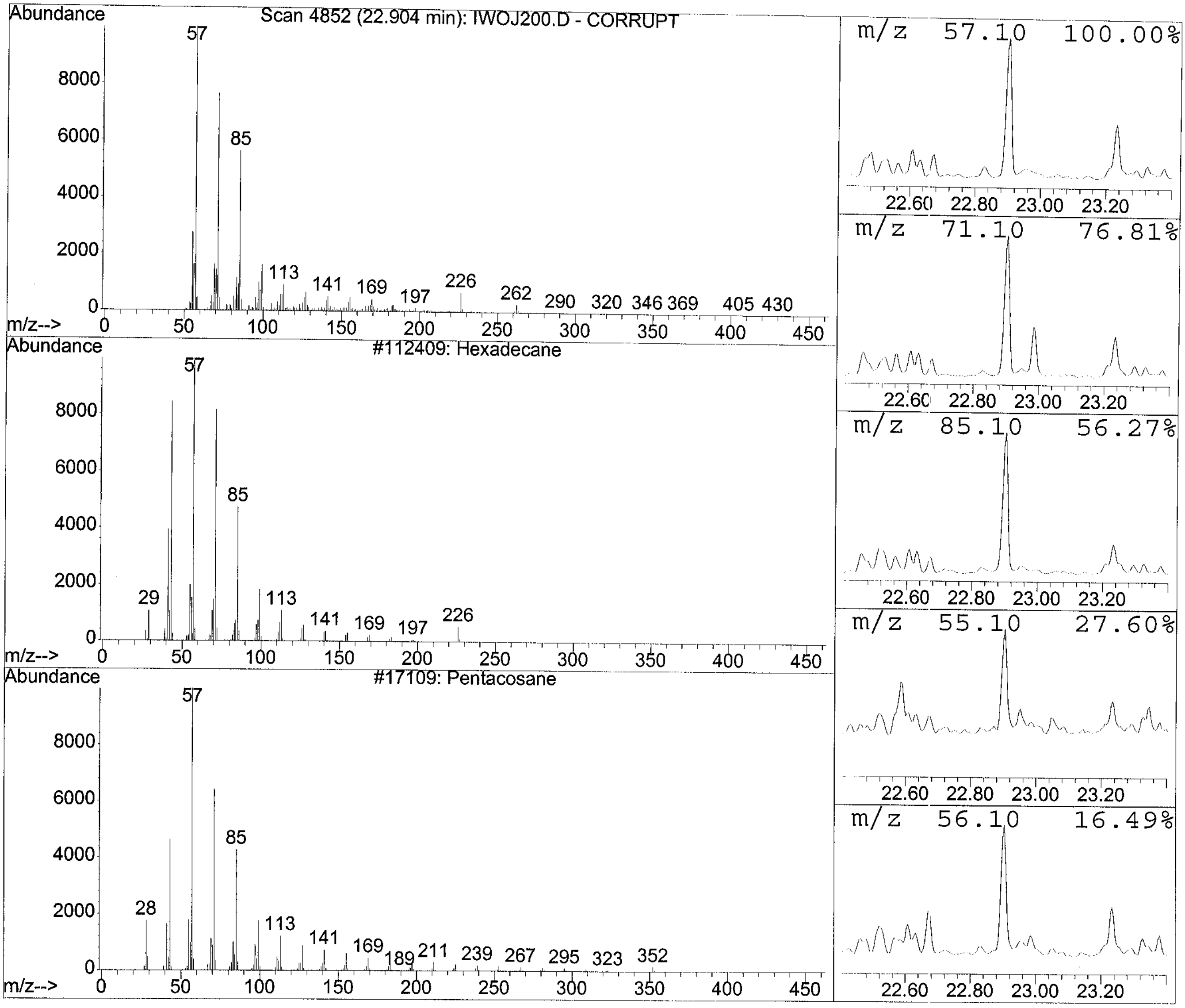


Peak Number: 96 at 22.72 min Area: 14469185 Area % 0.22

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Naphthalene, 1,6,7-trimethyl-	123887	002245-38-7	98
2 Naphthalene, 1,6,7-trimethyl-	124867	002245-38-7	97

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

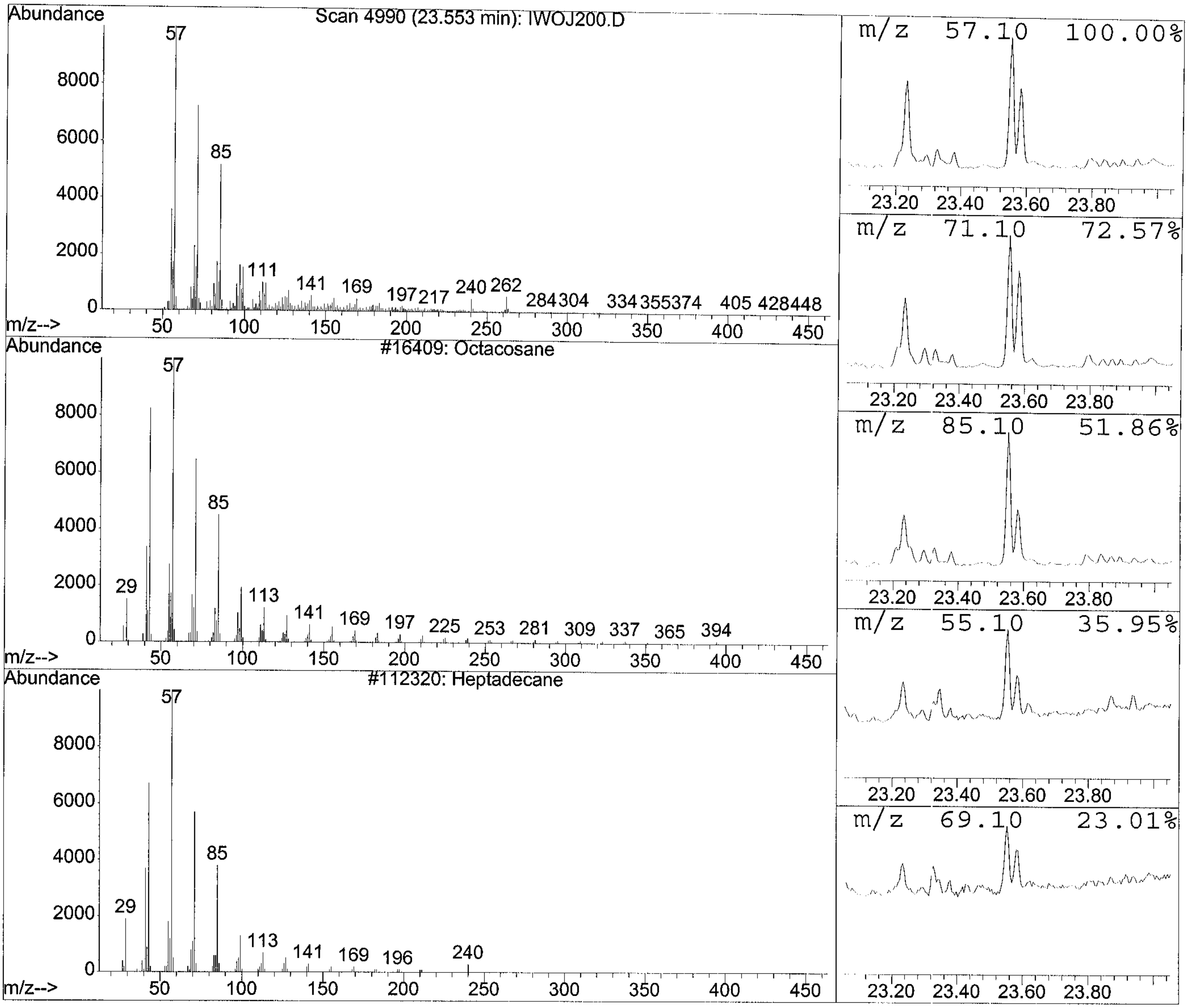


Peak Number: 97 at 22.90 min Area: 35360101 Area % 0.55

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Hexadecane	112409	000544-76-3	98
2 Pentacosane	17109	000629-99-2	96

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

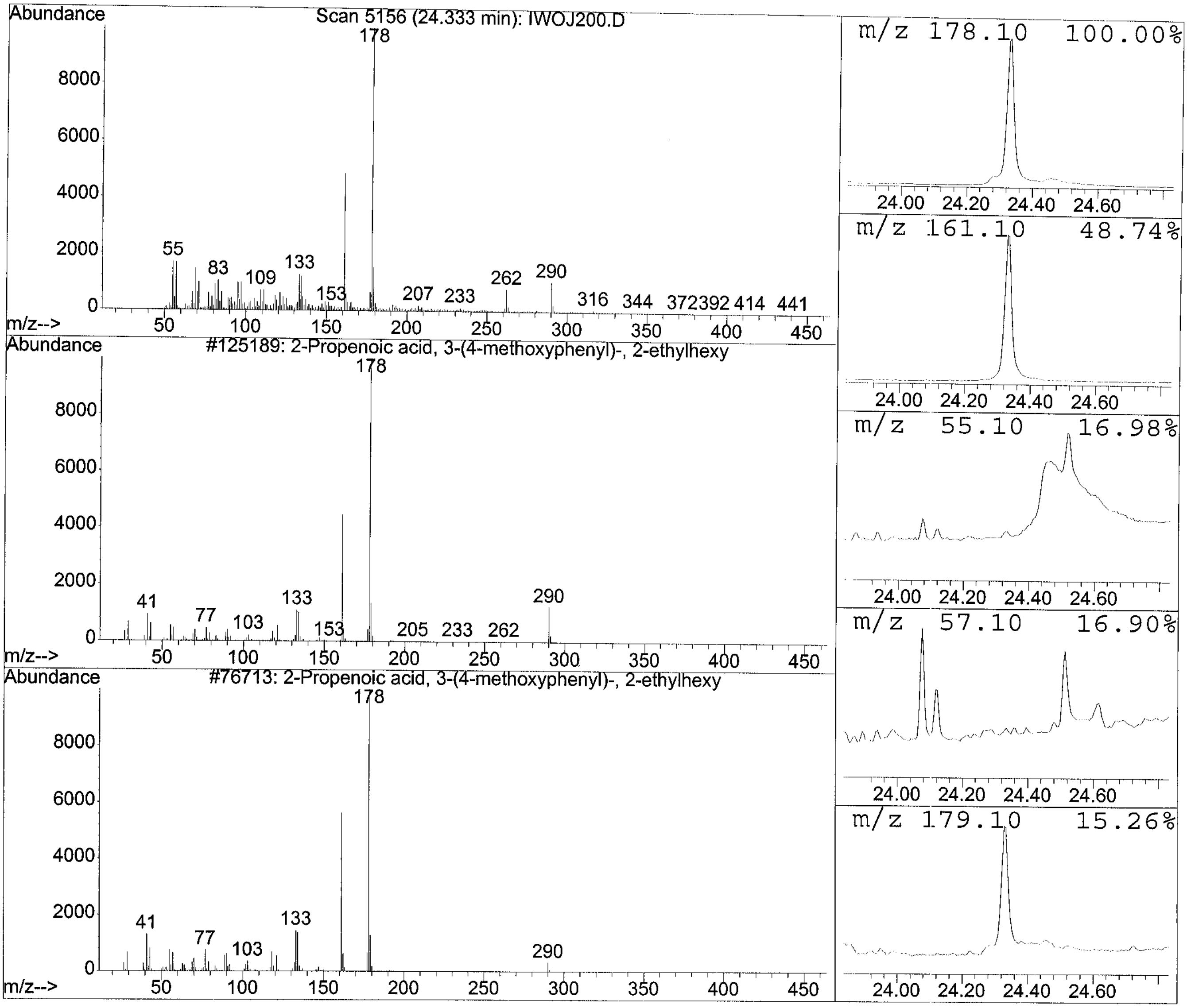


Peak Number: 98 at 23.55 min Area: 16914572 Area % 0.26

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Octacosane	16409	000630-02-4	96
2 Heptadecane	112320	000629-78-7	96

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex

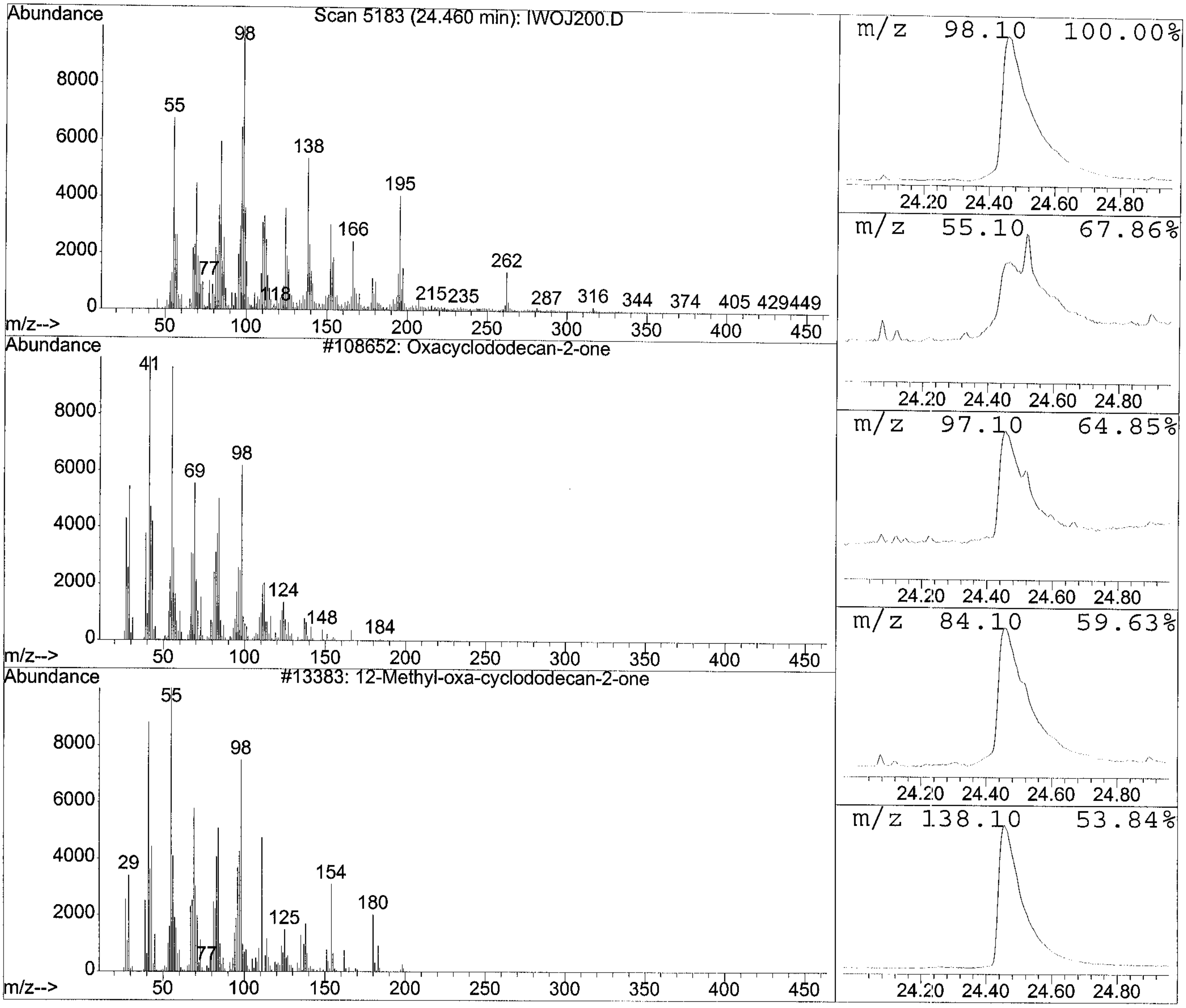


Peak Number: 99 at 24.33 min Area: 21256182 Area % 0.33

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 2-Propenoic acid, 3-(4-methoxypheny	125189	005466-77-3	96
2 2-Propenoic acid, 3-(4-methoxypheny	76713	005466-77-3	93

Library Search Report - RTE Integrator

Unknown Spectrum based on Apex



Peak Number: 100 at 24.46 min Area: 110081409 Area % 1.70

The 3 best hits from each library.	Ref#	CAS#	Qual
D:\DATABASE\NIST98.L			
1 Oxacyclododecan-2-one	108652	001725-03-7	42
2 12-Methyl-oxa-cyclododecan-2-one	13383	1000193-59-0	41